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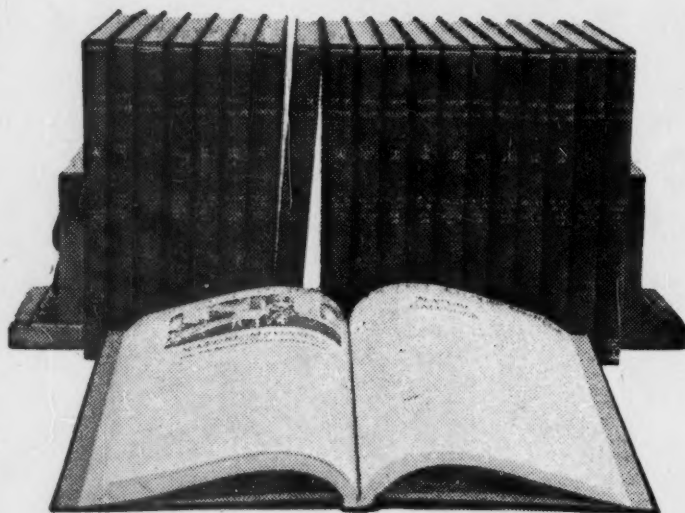
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Conservation in Reverse

Little Mountain State Park near Guntherville, Alabama, comprises 4000 acres originally owned by the Tennessee Valley Authority. In 1947 TVA gave 3740 acres of this to Alabama, and leased to the State the balance, mostly the area around Guntherville Lake. The acreage was given parks status which, by Alabama law, means "any area of land primarily valuable for recreational purposes because of its scenic historic, prehistoric, archeologic, scientific, or other distinctive characteristics, or natural features." Last August the State Director of Conservation, William Drinkard, signed a contract allowing the Davis Lumber Company of Cullman, Alabama, owned by State Representative Bryce Davis, to log the 3740 acres, cutting trees down to one-foot diameter. This has been going forward in such a destructive manner that local protests have grown to a storm. All values of the park—scenic, scientific and recreational—are rapidly being threatened. Local anger has resulted in some restraint in methods, but with no assurance of preservation of the park. This is an example of what politics and private greed can do to a public area, and it is interesting to note that the area was conveyed by TVA with a stipulation that it could be taken back if the State did not live up to recognized State Park standards in Alabama. It would appear that TVA has ample reason to withdraw the land to protect it from ruin.

Needs for Timber

Two outstanding facts were developed in the preliminary Timber Resource Review of the U.S. Forest Service, made in cooperation with State foresters, other State agencies, forest industries and public and private organizations. Findings indicate that the Nation's timber requirements are expected to be so high by the end of the century that timber growth will need to be from 70 to 120 percent greater than it now is. It was also concluded that improved forest management at recent rates of progress appears unequal to providing a balance between cut and growth at the year 2000. This means that further acceleration in forest management and production on both public and private lands must be attained if anticipated demands are to be met.



Motherless little Klaus never cries—though he's often sad-eyed and pensive. The six-year old boy has known much misery ever since his family was forced to flee East Germany with only the clothes on their backs. After months of wandering, they found refuge in a West German village. Then his mother died.

Although Klaus misses his mother terribly, much of his listlessness is the result of malnutrition. Often, there is very little food in the primitive shed where he lives with his father. Recuperating from a serious operation, the father can earn only a few pennies a day doing odd jobs. He is fighting valiantly to keep Klaus and to bring him up to be a good citizen.

To take this sensitive, imaginative boy from his father would be too cruel—Klaus shows talent. He has no toys, so he sprawls on the ground and spends hours drawing pictures in the dust with a stick. Perhaps he will grow up to be an artist...an architect...an engineer. In time, the father will be able to work again as a truck driver, will be able to afford better living quarters and good nourishing food. Until then, you can help keep them together, help make Klaus' future secure.

HOW YOU CAN HELP KLAUS

You can help Klaus or another needy child through the Child Sponsorship Plan of Save the Children Federation. By undertaking a sponsorship, you will provide funds to purchase food, warm clothing, bedding, school supplies, and other necessities for "your" child. The cost is only \$120 a year, just \$10 a month. Full information about the child you sponsor and a photograph will be sent to you. You may correspond with "your" child and his family, so that your generous material aid becomes part of a larger gift of understanding and friendship.

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Nature IN PRINT

By HOWARD ZAHNISER

"THE CALENDAR," writes Walter Collins O'Kane in a volume of forest reflections and observations entitled *The Cabin*, after its center of interest—"the calendar is the product of mathematics and astronomy, which have no blood in their veins, no power to exercise judgment." The calendar, he observes further, "caught in the web of its own calculations," has to arrange for an extra day every four years, and "makes mistakes all the time, over and over, year after year."

Mr. O'Kane believes there is a certain "nonsense" in calendars: "Just because astronomy finds that a specific geometric angle has been reached by the sun does not mean that everything is due to start growing or to stop." He perceives, in fact, considerable disadvantages in many contrivances of our civilization and values his cabin, for one reason, because it is shy, retreating from "the hurry of the city streets, the pressures of power and speed, the confusions of arguments and theories, the conflicts of men and nations."

He finds the surroundings of the cabin interesting and rich in assurances. The trees, he remarks, have no such difficulty as the calendar has in knowing the time of year. "The trees and the other plants," he says, "can interpret and come to conclusions."

That is what Walter Collins O'Kane himself has done in his New England woodland retreat, and in this volume, *The Cabin*. Not only has he written delightful and intriguing short essays (for the most part less than a page in length) on ferns, squirrels, trout, catnip, ponds, trees, partridges, dandelions, and so forth and so on, but also he himself has deftly interpreted and concluded.

"In occasional solitude," he reflects, "lies the path to much that men need." In the woods, he knows, "strength and tenderness, majesty and frailty, dwell together," and there, in his cabin, in his occasional woodland solitude, he has "a place in life from which to look abroad in tranquillity, in confidence, and in faith."

It has been a rich pleasure for me to share *The Cabin* and make from it, as it were, excursions in reading. Among the allergies that Mr. O'Kane whimsically attributes to the cabin is the Sunday newspaper, and as a matter of fact he says nothing of reading at all as among the pleasures of his cabin solitude. Yet I am sure that I and many of my own readers (if I may imply so large a group) would count quiet reading and far journeys in print as among the cabin's enjoyments.

Mr. O'Kane's roads to his cabin, he tells us, start with an eight-lane parkway. The eight lanes become four. Then parkway becomes three-lane highway, and this gives way to paved road of two-car width, followed by gravelled road, wheel-tracks through the woods, and path. At the end of this sequence of civilization's progress reversed stands the cabin.

Mr. O'Kane admits that on the return trip you can start at the cabin and keep in step with progress, the only difficulty being "that you wind up in a big city."

One of the journeys that I imagine for myself, however, disregards all such orderly retreats from solitude; from the cabin itself it transports me at once to *Highway of the Sun*, Victor Wolfgang von Hagen's account of his two-year expedition in Peru, retracing—and rediscovering some parts of—the marvellous road system of the Incas, half a millenium ago. Alexander von Humboldt described the roads of the Incas as "the most useful and stupendous works ever executed by man."

To find again these Inca works, two women and four men made up the expedition that started out in the winter of 1952. Victor von Hagen in his account of it, which starts at Lake Titicaca and ends at Cajamarca, "where the end of the Inca Empire took place," not only enriches my own sense of the geography of my own world and its inhabitants, but "by truck, by mule, by airplane, on foot" leads me back also "through the centuries to the Inca civilization," and incidentally lets me con-



Frontispiece drawing for *The Cabin* by Francis Lee Jaques.

template again the Bridge of San Luis Rey and its mystery.

Civilization, von Hagen suggests, may be "the building of cities, the division and exploitation of labor, the conversion of resources, the creation of large social units, the complex religious organizations, the keeping of records, the building of monumental architecture, the linking of cities with roads and their corollaries, communications, and bridges."

Civilization is a road, he says, and it assuredly is so, yet his own book about a far-away road persisting from a far-off time and traversing mountains and deserts, along rivers and lakes, might well "belong" on the shelf of a cabin of occasional solitude.

Beside it might be another recent volume that deals with a far-off place, but one that, rather than retracing a highway system of an ancient civilization, tells of a first crossing of southern Africa with a ten-ton truck, from ocean to ocean, Atlantic to Indian, representing the "penetration of practically unexplored territory by man and machine." This expedition, of six Frenchmen and three South Africans, is described in its leader's account, another interesting volume, Francois Balsan's *Capricorn Road*, named for the Tropic of Capricorn, that imaginary line which marks the southern boundary of the Torrid Zone and crosses the area of this expedition's travels. Besides its truck-travel demonstration and its many other observations, this 1951 expedition re-

discovered a lost city, experienced lion hunting and witch doctoring, and, as its dust jacket summarizes, "discovered the Kalahari bushmen, the oldest race in Africa," still living a "stone-age existence."

These experiences with the bushmen called to mind my recent reading of another new African volume—*Baba of Karo: A Woman of the Muslim Hausa*, whose autobiography (which is this book) was recorded near the end of her life, during a six-weeks period in 1949-50, by Mary Smith, the wife of an English anthropologist. It was far to the north of the Tropic of Capricorn that Baba lived—in the western Sudan, in northern Nigeria—and her story, of many marriages and the social customs of a people "strange" to me, probably leads me astray from my proper theme. Yet in the cabin setting that I have assumed there is leisure for such indulgences, and I was going to suggest next another African volume anyhow—John Taylor's *Pondoro: Last of the Ivory Hunters*.

One of the most interesting sections of this book is the concluding one on "The African Himself," and I find myself thinking of fellow human beings of Africa as part of the continent's life, as part of its "nature," just as I increasingly find myself thinking of all life as part of my own. I suppose thus that John Taylor, self-styled poacher, and his companions preying on the elephants, the lions, and the other great creatures of the African wilds, are my own fellow-men, and I share with them, too.

Certainly I do find myself "understanding" John Taylor, admiring his prowess in the jungle, fascinated by his tales of hunting, respecting his knowledge of the wild creatures, and most assuredly sharing his high regard for "the African himself." Yet I can also hardly help but regret that there are those who, like John Taylor, say: "I wander whithersoever I list and shoot whatsoever I want, without asking permission," or who find elephant hunting "an obsession" and admit, "I know of few things in this world that give a man such satisfaction as the sight and memory of a decent pile of gleaming tusks shot by himself—legitimately or otherwise."

One can hope that Mr. Taylor is correct in calling himself, in his volume's subtitle, *Last of the Ivory Hunters*. But the book's long tales and descriptions, sympathetic in

their way and understanding, of elephant, rhinoceros, hippopotamus, water buffalo, lion, leopard, are certainly great reading experiences. So also are the chapters on "non-dangerous animals"—giraffe, eland, okapi, bongo, oryx, wildebeest, kudu, waterbuck—and even on what he calls "varmints"—crocodile, hyena, jackal, baboon, bush pig, wart hog, monkeys, and snakes.

Mr. Taylor emphasizes that "snakes do vastly more good than harm" and, speaking of varmints, "the vast majority of them are nothing of the sort."

Not long after reading Mr. Taylor's *Pondoro* I saw the Walt Disney motion picture *The African Lion*. I found my enjoyment of the film enriched by the knowledge and lore of the book, but I wished that the understanding philosophy of the film in seeing in and for all life a reason or friendly excuse might be more prevalent. There were no men in the film, however, and surely we men, predators as we are, are a part of the scheme too.

John Taylor was the son of one of the world's great surgeons, and before heading away to Africa had had a conventional English education. To think of him "for the most part in remote sections of the continent (Africa), naked like the tribes around him, living entirely by hunting and bartering what he shoots," is itself an intimation of our essential at-home-ness in the wild. The thought brings us back to the cabin.

Here are still three books on my imaginary shelf. One of them, called to mind by Walter Collins O'Kane's delight in brook and pond, is a small volume of essays entitled *The Moving Waters*, by John Stewart Collis, which is as sensitive and eloquent as it is informative—a volume for pleasant and reflective reading and study.

Another is a full-length scholarly but nonetheless appreciative work on *The Wren*, by Edward A. Armstrong. As I have in my suburban residence, I could also in the time-rich cabin enjoy many hours in reading and contemplating this "definitive" work on that lively creature we call the winter wren. Harvey Broome in his "Mountain Notebook" in *The Living Wilderness* has exclaimed that "no other creature is anywhere so utterly irrepressible in its song and so completely and spontaneously alive." In the Rev. Mr. Armstrong's tome, if not otherwise, I could now

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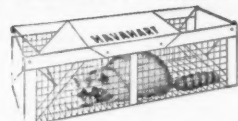
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have the winter wren—simply "wren" to him—for my contemplative enjoyments.

And here in Langton Carleton Keyes's sequence of sonnets presenting a biography, *Thoreau: Voice of the Edgeland*, is surely a cabin volume. The first eight lines of each sonnet, its octet, is ingeniously but faithfully fashioned from Thoreau's own words; the last six lines, the sextet, are our poet's own interpretations. There are two hundred and nine of these sonnets! Here is one that touches on Thoreau's own cabin living at Walden Pond and quotes a Thoreau description of winter changing to spring:

Thoreau:

"The change from winter to serene,
mild weather
Is instant crisis that all things proclaim:

Upon a sudden, an infusion came
Of tender light, filled house and me
together.

I look and lo the Pond has slipped
its tether

Of gray ice—there sweet, virginal,
without shame,
Its bosom beckons! Robins boldly
name

It springtime. Geese descend on
whistling feather!"

One reason you had come to Walden
Pond

Was to have leisure to watch spring
come in,
From radix leaves to loveliest of May
flowers.

You marveled how men failed to feel
the bond
That bound you to embrace the earth
and win

Some knowledge of the life that Life
empowers.

So our far journeys from Walter Collins O'Kane's cabin have brought us back to Walden, to another cabin, and to the end of our present excursions at least. Happy New Year to all!

Baba of Koro: A Woman of the Muslim Hausa. By M. F. Smith. New York: Philosophical Library. 1955. 299 pp. (5¾ by 8¾ in.), with preface by Daryll Forde, introduction by M. Y. Smith, frontispiece photograph, sketch of Hausa compound, tipped-in map, glossary of Hausa terms, notes, and index. \$7.50.

Capricorn Road. By Francois Bal-san. Translated from the French by

Pamela Search. New York: Philosophical Library. 1955. 252 pp. (5¾ by 8¾ in.), with 17 photographs on 11 plates. (No map: no index.) \$4.75.

Highway of the Sun. By Victor W. von Hagen. New York: Duell, Sloan and Pearce. Boston and Toronto: Little, Brown and Company. 1955. 320 pp. (5¾ by 8¾ in.), with 87 photographs on 32 plates, 4 text maps, end-paper map, bibliography, and index. \$6.

Pondoro: Last of the Ivory Hunters. By John Taylor. New York: Simon and Schuster. 1955. xxviii + 355 pp. (6½ by 9¼ in.), with 29 photographs on 8 plates and note about the author (no index). \$4.95.

The Cabin. By Walter Collins O'Kane. Sanbornville, New Hampshire: Wake-Brook House. 1955. 247 pp. (5¾ by 8¾ in.), with 14 drawings by Francis Lee Jaques (including 4 extending across 2-page spreads). \$3.50. (No index.)

The Moving Waters. By John Stewart Collis. New York: William Sloane Associates. 1955. 246 pp. (5¼ by 8 in.) with 5 drawings by Nicholas Egon, bibliography, and index. \$3.75.

The Wren. By Edward A. Armstrong. London: Collins. (Distributed in the United States by the Macmillan Co., New York.) 1955. viii + 312 pp. (6½ by 8¾ in.) with 41 text figures (drawings and diagrams), 19 photographs on 8 plates, bibliography, and index. \$6.

Thoreau: Voice in the Edgeland. A Biography in Sonnets. By Langley Carleton Keyes. Chapel Hill: University of North Carolina Press. 1955. xvi + 131 pp. (5¾ by 8¾ in.) \$2.50.

Our Soils and Their Management

By Roy L. Donahue. Danville, Illinois. 1955. Interstate Printers and Publishers. 446 pages. Illustrated. \$3.75.

Having lived and worked in the East and mid-West, the author of this book writes against a quite broad background of experience. Chairman of the Department of Agronomy at the University of New Hampshire at Durham, he is not only an agronomist but a forester. Dr. Donahue's text is clear and direct, thus making his book of definite use to a wide range of individuals. These would include teachers of vocational agriculture, practicing farmers, vocational agriculture students and others. It

seems to us that the author combines both high textbook value with practical information in handling his subject, which is certainly a basic and vital one.

Whimpie of Bramble Haw

By Nell Mabey. Rockport, Maine. 1955. Falmouth Publishing House. 86 pages. Illustrated by Betty Fogg McIntosh. \$3.00.

If you love dogs you will love the charming poems by Nell Mabey inspired by the dog whose name provides the title of this book. Both Whimpie and the poet are also lovers of Nature, and their combined poetic adventuring in the outdoors finds expression in this attractive book. Miss Mabey writes of Whimpie in many moods and in many situations, from his bath to jousting with a phoebe bird.

California Grizzly

By Tracy I. Storer and Lloyd P. Tevis, Jr. Berkeley, California. 1955. University of California Press. 335 pages. Illustrated. \$7.50.

Today the California grizzly survives only on the Bear Flag and the Great Seal of California, and in place names. It was, however, a native species and one intimately related to man as he shaped the history of the Golden State. When the grizzly reached the dubious distinction of extinction, no account of its natural history had been written. By the 1920s it was no more. Now two California zoologists have collaborated to provide the first comprehensive account of these great bears. Their book is both history of the State and of a mammal that bore its name.

The Birds of Massachusetts

By Ludlow Griscom and Dorothy E. Snyder. Salem, Massachusetts. 1955. Peabody Museum. 295 pages. Cloth, \$4.95; paper, \$3.75.

This is a revised and annotated check list of the birds of the Bay State. It is based in large part upon the personal knowledge of the birds of Massachusetts on the part of the authors. As to the annotated list the authors state: "For every bird officially on the state list we require a specimen, a banding record by a reputable ornithologist, or a recognizable photograph on file and readily available for examination. All other forms have been placed in the Hypothetical List, without regard to the observer."

Contents noted

BY THE EDITOR

FROM OUR DAD COMES EMPHATIC DISSENT

from the statement in the November issue that "it is a myth that snakes suck milk from cows." Pop is a mighty young eighty-six years. When he was a boy on his grandfather's farm, according to information relayed in Mother's weekly letter, he saw a snake "taking milk from a cow." It was a cow that had stopped giving milk. A black snake, Dad says, was wrapped around the cow's leg, sucking away. Pop heaved a stone and the snake started away, but was later captured and taken to Charlie Maynard, the local naturalist. Charlie cut the snake open and, according to Dad, it had milk inside it. So Grandfather gave Dad two dollars for solving the mystery. Perhaps we should not risk peace in the family by pointing out to Dad that a snake is not anatomically equipped for sucking, that its teeth would be mighty annoying to a cow, and that, even could the snake take milk, it could not possibly take enough to be noticed at a milking. And perhaps Pop has forgotten that cows vary in the quantity of milk they give from time to time. But, in the end it is that two dollars that makes Dad's story additionally suspect. Two dollars was a lot of money when Pop was a boy, and we always understood that Great-grandfather was an especially slow man with a buck.

THE WHOOPERS ARE BACK AT ARANSAS.

Almost as though they knew how much attention was being directed their way, the whooping cranes made their perilous journey from Canada to the refuge in Texas—twenty adults and eight young. The youngsters represent the biggest accretion in numbers to reach winter sanctuary since it was established twenty years ago. The Secretary of the Interior issued a special plea that the birds be allowed a safe flight. The Department of Defense bowed to public sentiment and agreed to do its photo-flash bombing away from the Aransas Refuge. The Fish and Wildlife Service closed an additional 4640 acres of land and water area adjoining the refuge to provide added protection for the great white birds. The press was most generous in publicizing the plight of the whoopers, and arousing sentiment in support of giving them every chance to survive. All this paid off.

SECRETARY OF THE INTERIOR DOUGLAS MCKAY

is entitled to the thanks of conservationists for his firm "No" in response to the Army's request for a large and important piece of Wichita Mountains National Wildlife Refuge in Oklahoma. We hope folks will let the Secretary know of their appreciation. A recent report from

this area by Charles H. Callison, Conservation Director of the National Wildlife Federation, is most worthy of quotation here. Mr. Callison visited the disputed area shortly after heavy rains had soaked it. He saw wild turkeys, deer, bison and some of the Texas longhorns for which the area is famous. The Army had been there, too, conducting maneuvers permitted under existing agreement.

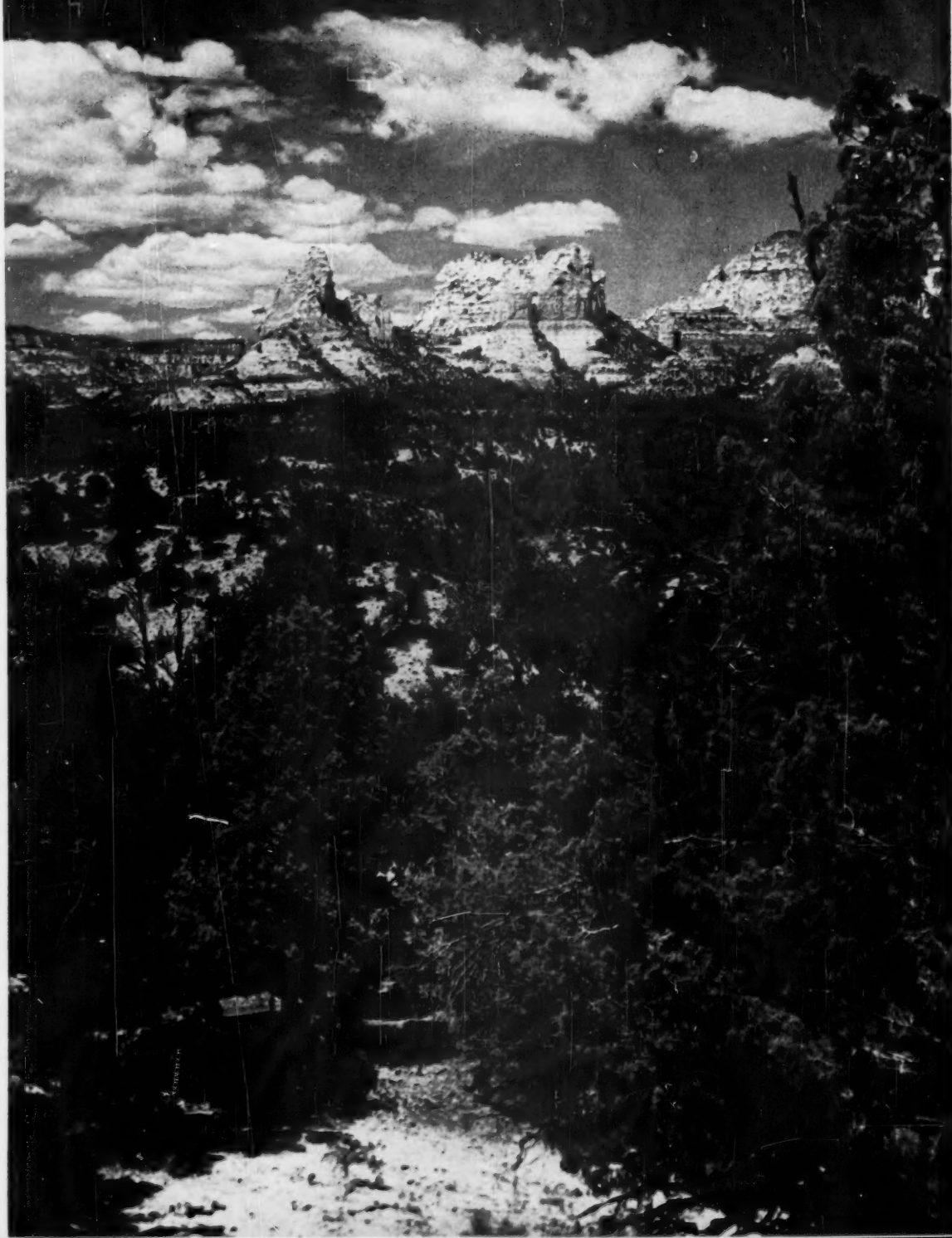
"The tracks left by the Army," says Mr. Callison, "plainly refute their argument that by taking over the area they will not damage the habitat or destroy the wildlife. Heavy truck and tractor wheels had ripped deeply through the sod, up and down hills, setting the stage for severe gully erosion and siltation of the streams and lakes. Patches of shrubby cover had been flattened by the traffic. Anyone familiar with the habits of the sensitive wild turkey can predict what will happen to the birds when this kind of disturbance becomes common.

"The grasslands of the Refuge must approximate what the Great Plains looked like when the covered wagons first rolled westward and the pioneers gaped in astonishment at the seemingly endless lands and the uncounted herds of bison. Tall, rich stands of Indian grass, big and little bluestem, buffalo grass and other plants of the virgin prairie—it is an astounding sight! No wonder the range experts, the agronomists and other scientists regard this reservation as an invaluable laboratory and come from near and far to study this bit of native America, its plant successions and its ecology. To the non-technical visitor, the rolling vistas dotted with big game and framed by the red-granite mountains provide unique and inspiring scenery."

And as a postscript to the Wichita issue—indeed, we should think, an end to it—is the announcement of Army plans to expand the Fort Bliss artillery school in Texas by 647,000 acres. This should allow plenty of room to train men in the use of new, long-range weapons, which was why the Army sought the 10,700 acres of the wildlife refuge.

MARK TWAIN DID NOT SAY: "Everybody talks about the weather but nobody does anything about it." So writes Mrs. Lee Newman, Town and Village Historian of Angelica, New York. Charles Dudley Warner said this in an editorial in the Hartford, Connecticut, *Courant*, circa 1890, she says. *Bartlett's Familiar Quotations* is strangely noncommittal, quoting both Mr. Clemens and Mr. Warner but crediting neither with this observation.

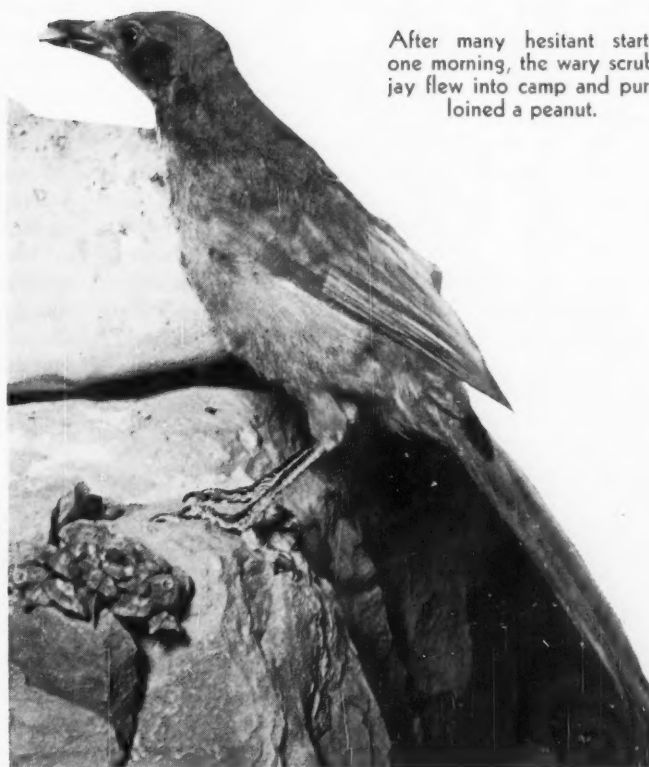
R.W.W.



Land of the Blue Crows

By JOHN LINDSEY BLACKFORD

Photographs by the author



After many hesitant starts one morning, the wary scrub jay flew into camp and purloined a peanut.

SCRAMBLING up over rocky foothills and broken mesa rims, swinging away over arid benches and plateaus, the intriguing Pygmy Forest of the Great Basin and the Southwest ranges between aromatic sageland, or desert, and the high mountain forests of the West. Its domain is that of the fragrant junipers and piñon pines—always its dominant and typical cover. Many scientists know this dwarfish, sunbathed pygmy wood as the Xerophytic Coniferous Forest. Others call it the Piñon-Juniper Association. To bird lovers—to this one, at least,—it is the memorable Land of the Blue Crows.

Kee-yarr', kee-yarr', kee-yarr'! I was tramping in the nut pine hills south of Nephi, Utah, when a flock of fifty or more piñon jays were encountered straggling through the diminutive wood. Harsh and rattling calls, chucks and chatter, with sharp caw-like cries of warning, thoroughly confirmed the "pinyon squawkers" as the noisiest birds of the Southwest. They were energetically deployed across the stony or chert-strewn floor of the open, scattered stands, the restive rearguard rising raucously and trailing forward colorfully over the foraging band.

Among these talkative grasshopper hunters and pine-

nut gatherers, one stumpy-tailed *Piñonero* suddenly started up a vigorous spurt of dust. It streaked ahead of him to vanish at the base of an ancient, shaggy-barked juniper. Alert, the "blue crow" arrived there almost as quickly as the speedy little dust trail. Then for minutes I watched the delighted piñon jay jab and tug at an obdurate, dusty lizard that had whipped nearly out of sight and secreted itself among gnarled roots of the cedar. The contest proved a drawn-out affair. So, too, was the reptile when he finally emerged unwillingly, to be carried off in the bill of his roguish adversary.

Undoubtedly the wandering piñon jay is the most characteristic feathered character of the far-flung pygmy conifers, the veritable winged expression of this roving western woodland. Over the low residual hills, down into the sagebrush borderlands, up the steep, red rim-rocks where piñon and juniper greenly embrace cliff rose and mountain mahogany, the jays follow them faithfully. There they cradle their speckled, blue-white eggs as colony nesters; here one year, never seen another. They are as nomadic as the wide-ranging nut pines and "cedars" that shelter and provision them with pine nut and juniper berry. Wherever curls the hogan smoke of the Navajo, or drifts the lingering incense of piñons from adobe chimneys of the pueblos, there too will be remembered the blue flights of the *piñoneros*. There is the redolent land of the piñon jays; the beckoning home of the blue crows.

The Pygmy Forest consists usually of both junipers and piñon pine. But north of a line striking across

←
Climbing up the Red Rocks at Sedona, swinging away across distant mesas, the Piñon-Juniper or Pygmy Forest contrasts its vivid green with roseate-red sandstones of Oak Creek Rim in southern Coconino County, Arizona. Widely in the West this dwarfed woodland marks the Upper Sonoran Life Zone.

Nevada's Pyramid Lake, juniper alone stretches away over vast leagues into Oregon, southern Idaho and the borderlands of Wyoming. The trees grow in park-like stands, gathering frequently in narrow belts along foothills of the mountain ranges. They also claim the low, dry, mountain slopes, exposed canyon sides and semi-arid mesas. On the great central tablelands of the Colorado River region, where the woodland is seen at its best, piñons and junipers form continuous stands miles in extent. Unbounded reaches of this dwarf timberland are typical of the Grand Canyon uplift and of Colorado's Mesa Verde and Uncompaghre Plateaus.

Through these wide-spaced groves and clambering hillside cover, scatter small-leaved shrubs such as chamois, antelope brush, algerita, cliff rose, and lemonade sumac or squawbush. A sandy or rubble-strewn ground

Deep-shadowed clefts and gorges of the rock midway up were left behind. On the face of the fractured cliffs, where twisted piñons scale the precipitous rock and the zigzag trail wraps itself tortuously about sheer heights as it makes for the mesa top, I dropped my pack and flattened on the narrow, flinty track.

About the Great White Throne, those masters of the heated up-drafts, the turkey vultures, wheeled on seemingly motionless pinions. Several buzzards swept up the canyon, mounting higher in their funereal inspection of the dwarfed nut pines that crown the sharp rim of the Kolob Plateau. Finally, as if they had located the object of their search, they dropped towards me in vast descending arcs. I did not move. Only eyes, half closed, followed the spiral sweep of those gray-black wings that hang forever above the piñon-juniper wood-



Among piñons and "cedars" of the hills the pert plain titmouse troops in companionable bands with mountain chickadees, black-throated gray warblers, bush-tits, hairy woodpeckers and Bewick wrens.

floor, bearing occasional succulents—prickly pear and yucca, which infiltrate from torrid reaches south—is characteristic.

Climatically the juniper-piñon pineland is intermediate between chaparral and sageland below and mountain forest above. Summer temperatures are high. Winters are moderate, although snow lies for some time over most of the woodland regions.

Food for birds is abundant in the Pygmy Forest, at least for those birds with specialized appetites. Resinous juniper berries and jumbo-sized kernels of the pine cones are staples. But production varies locally from year to year, resulting in the wandering habits of feathered harvesters. Seeking them out, the bird man also becomes a woodland wanderer, finding many odd adventures.

In late June, climbing Hidden Canyon Trail up Zion Canyon's painted, pine-topped eastern wall, I felt the desert heat strike with increasing severity. Fern-draped Hanging Gardens in the distant depths were forgotten.

lands. Soon their stiffly set flight feathers could be heard slicing the superheated air currents less than a stone's throw above. Then they swung away. I had failed to be a prospective corpse under the telescopic scrutiny of those expert coroners. They had found just another living disappointment in the Pygmy Forest!

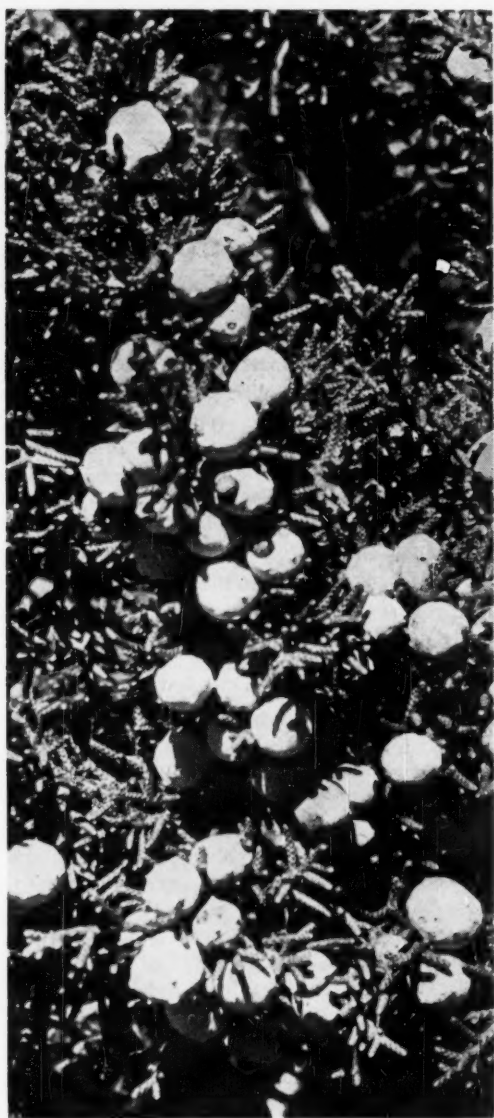
Camped again among sturdy, two-needled piñons of Colorado's cliff-dwelling-dotted Mesa Verde, there came new opportunity to observe the change in membership noted among bands of small feathered fry that troop the pygmy woodland, as compared with similar companies roaming mountain timberlands. Here plain titmice lead the mixed flocks and inspire esprit de corps. Bush-tits, Bewick wrens and black-throated gray warblers enlist as regulars. Chipping sparrows are more in evidence in these "expeditions" than I have ever seen them northwards. Sometimes a wandering solitary vireo joins them with her young. Yet, to remind of other bird companies, chickadees, white-breasted nuthatches and ever-popular hairy woodpeckers trail along at upper

elevations. You need only lower the glasses and listen dreamily to the animated conversation drifting airily through camp, to imagine that you recline among soaring ponderosa pines and darkly mantled firs.

In their routine excursions through the grove, it became clear that these Southwesterners have a chosen territory and pursue a regular beat, just as do mountaineering chickadee-nuthatch bands of the mighty evergreens.

The role of the witty, inquisitive scrub jays—at least their welcome by other feathered troopers—sometimes appeared doubtful. The garrulous blue-gray rascals were wary visitors. Peanuts could be got as readily, and

Red-brown "berries" of California juniper, together with the berry-like cones of Great Basin and Rocky Mountain "cedars," provide dependable food stores for winged dwellers in the far-flung Pygmy Forest—the Land of the Blue Crows.



The winging flash of roseate pinions and familiar wicka call of the red-shafted flicker are well known in the Pygmy Forest.

assuredly with greater safety, by noisy descent upon any titmouse that conveniently carried them from camp table into the sheltering conifers. But one clever fellow frequently lingered behind. When the coast was clear of sharp-eyed midget comrades, this engaging bandit added to his future stores by carefully caching self-won booty away among the pines.

After many hesitant starts one morning, the jay flew into camp and purloined a peanut. With deep thrust of his bill he buried it in nut-brown needle duff. Then several piñon needles and small twigs were cast upon the cache. Finally satisfied on the score of security, he took off with the air of one who has braved mortal danger and by superior strategy merited its reward!

Titmice are likewise provident in the event of unex-

pected bounty. One little visitor, making repeated trips to my open cupboard, was industriously concealing his take of peanuts in the shreddy bark-crevices of a desert juniper. Members of a nuthatch family were finding them. Fired by the courage of righteousness, the tufted titmouse vigorously drove the youngsters to another tree; then defiantly held his own with their rapier-billed nuthatch parent. Soon all departed together to join the same amiable company of rovers.

On piñon flats, and at the cedar-dotted mouths of rocky canyons well down in the Upper Sonoran Zone, where nut pines and juniper habitually merge with the flora of the desert, the brown towhee is an abundant resident. Rufous-crowned and of a gray-buff and sepia-brown color, his song too is one of pleasing monotony. Such modest attributes, and "Brown Chippy's" friendliness, make him a favorite about the adobe courtyards and plazas of Southwestern pueblos.

It is a morning of enduring thrills in the fragrant juniper-piñon-clad foothills when the birdman meets a covey of scaled quail. The "cotton tops" come sailing swiftly down an arroyo, their fleet feet already running as they hit the hot sand.

For the outdoor lover, the picturesque junipers are never so vividly green as when viewed against massive vermilion and coral rimrock. Or, as in Monument Valley, seen among flaming mesas and sentinel rocks of the high desert. There, just once, I caught the golden flash of Scott's oriole speeding a-wing through the emerald cedars. The sight was worth my two hours of plodding that dawn across the orange-red sands.

While its dominant conifers are ever the same in the true Pygmy Forest, there is always such diversity in shrub layer and floor cover as constantly to awaken new interest. On Mesa Verde, penstemon, mariposa lily and sulphur flower grow with yucca, fendlera and antelope brush in the piñon-juniper aisles. My field notes tell that south of Kanosh, in Utah's erosional hills, rabbit-brush, prickly pear and sage relieve the sameness of sand and broken chert. Curl-leaf mountain mahogany and beauteous cliff rose climb profusely on Grand Canyon's

South Rim, where dwarfish nut pines and cedars take their stalwart stand. Widely, scrub oaks border and mingle with the pygmy conifers on arid slope and down in sunny ravine. East of Montezuma Well, Arizona's juniper-piñon pinelands intergrade with southern oaklands. There on a stony floor, cobbled and bouldered with vesiculated basalt, curious alligator-barked juniper meets its northern kin. Together they pattern with limited shade undercover scrub oak and salmon-flowered prickly pear.

A naturalist finds many siren trails crossing his own. First trace of the wild turkey north of the Colorado was discovered in cliff-dweller community sites. The moki ruins themselves lure you astray. In the story of the Ancient Ones the Pygmy Forest played a vital part. From mesa-top fields the early Basket Makers, and after them Pueblo and Cliff Dwellers, harvested beans, maize and squash. On the borders of clearings piñon pines supplied edible nutlets, building materials and useful resin. Down from the midget groves, by way of hand-hold ladders, the cliff people brought stringy fiber-bark of desert juniper to weave into sandals, mats and rough capes. Narrow-leaf yucca, a common habitant of the diminutive woodlands, served countless uses. To the primitives who knew its secrets, this dwarf timberland was a bountiful provider, just as always it is an irresistible invitation to adventure.

Wherever you may be, spring as it comes to the pygmy pinelands will return in your heart. Soon you will remember how the Cloud Pusher piles the black-bellied thunderheads of midsummer castle-high in the amazing blue. With autumn the purple-blue of piñon squawkers comes eddying over, their wondrous flocks calling softly, "Pin-yoney pin-yoney," as they garner wingless seeds from stubby cones. And at last, with the frost, magic wisp-veils of hogan smoke trail thinly above the far mesas.

If the red canyons are claiming you, if incense of the pueblos possesses you, then you know your heart is calling you; luring you back to the junipers and piñons, back to the Land of the Blue Crows! ❀ ❀ ❀

MOUNTAIN LIGHT

*What puzzled you so long
May somehow find an answer; sudden light
May flood the mind like song,
Swiftly erasing night.
It may be like Chocorua's mountain head
So furled with rain we could not see—
And then the shock of sunlight sped
Across each rain-washed tree
So that the mountain, stung to form,
Revealed its shoulders, shook off dark;
And we, now comforted and warm,
Stared up in wonder at that arc.*

Daniel Smythe



*An animal that time
passed by is Apus*

The Armored Shrimp

By JOHN REARDON

*Photographs by the author and Arthur S. Lockley;
drawing by Suzanne Arlen*

ONE OF America's most bizarre and fascinating animals is little known to either layman or naturalist. This strange creature, *Apus*, the armored shrimp, owes its anonymity to its Rip Van Winkle way of life, and to its peculiar choice of living places. Most water-dwellers choose permanent bodies of water, but *Apus* is restricted to ephemeral puddles, ponds or dry lakes. When found at all the armored shrimp may appear suddenly and in vast numbers where water had previously been absent for many months or even years.

In recent years this three-inch-long crustacean has been found in such unlikely places as a rain-filled depression in rock in arid Utah, in a cloud-burst-filled valley in the Mojave Desert, and on a lately emergent volcanic island in the Pacific.

Recently soldiers at Camp Irwin, an army camp in the desert south of Death Valley, were amazed to see Bicycle Dry Lake come alive with strange creatures, two weeks after a desert deluge had flooded the area. The writer and colleagues responded to inquiries from the amazed military and identified the strange creatures as being *Apus*, and three closely related forms having similar habits. Estimates indicated that the 5000-square-yard lake may have contained as many as 100,000 of the ephemeral crustaceans. It was certainly a startling sight to see the muddy yellow water literally boil with life where, two weeks before, even a scorpion would have been hard pressed to eke out an existence on the adobe-like surface of the dry lake. Hundreds of ducks and avocets had somehow managed to share our discovery, and were enjoying a feast at the expense of the armored shrimp and its relatives.

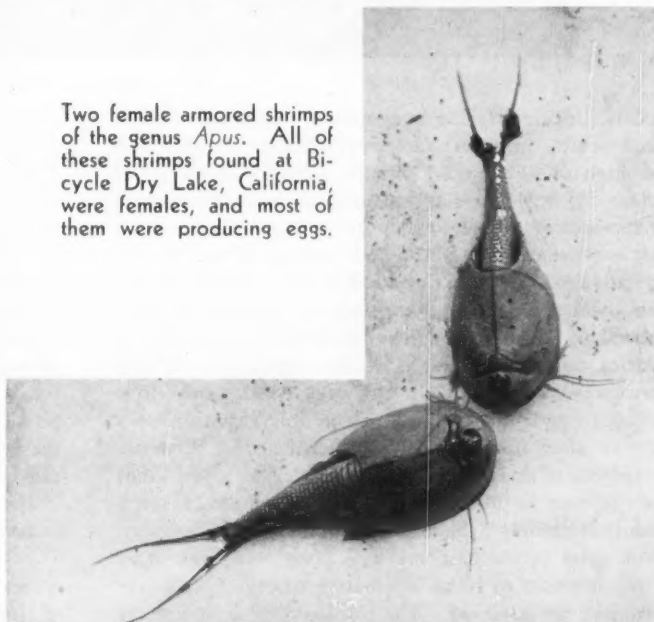
Apus, the armored shrimp, has a strange history and a fascinating way of life. A survivor of the most primitive group of crustaceans, the Euphylopoda, this creature

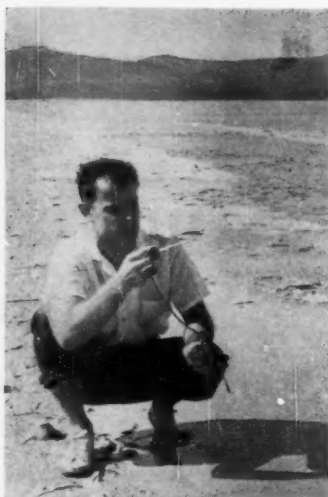
has remained almost unchanged for 180 million years. It is known in fossils of the Triassic period. Its ancestors, almost precisely identical with the living form, witnessed the rise and fall of the dinosaurs and remained unchanged as the mammals evolved from obscurity to dominance.

The appearance of *Apus* has been said to suggest the form of the king crab, *Limulus*. This resemblance is due to the domed shield or carapace, which spreads over the forward half of the animal. Two compound eyes peer from the shield. A jointed tail extends beyond the cover of the carapace. The many legs of the animal serve not only as aids in swimming but also as feeding accessories. Also, strangely, they function as gills.

Apus eggs have been known to hatch after as many as fourteen years of dormancy. No one knows precisely how long the eggs may retain the spark of life but the

Two female armored shrimps of the genus *Apus*. All of these shrimps found at Bicycle Dry Lake, California, were females, and most of them were producing eggs.



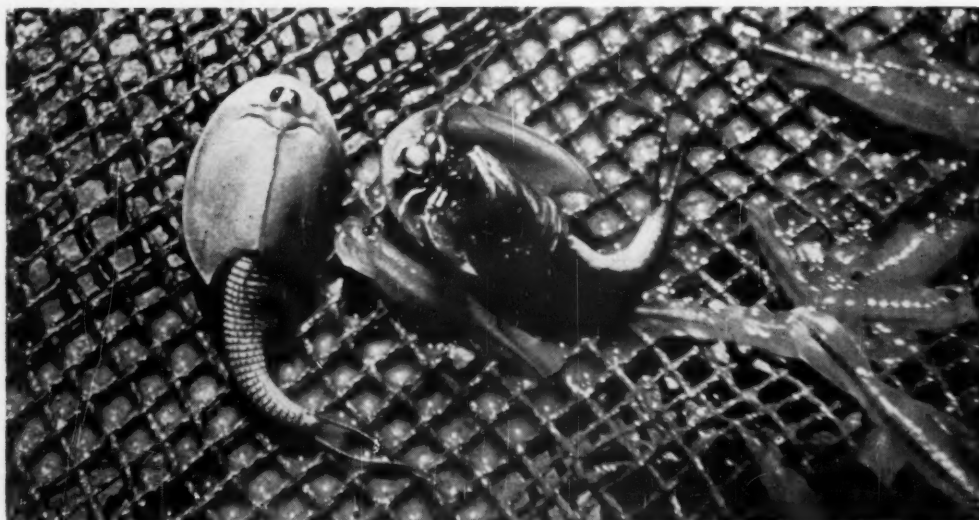


Professor Arthur S. Lockley takes the temperature of the Lake. Viable eggs were found in mud at 98 degrees F. and dry mud was recorded at 124 degrees F.

← Professor J. P. Welsh searches for shrimp eggs in the concrete-hard floor of Goldstone Dry Lake in the Mojave Desert.



→ Closeup of a seine haul from Bicycle Dry Lake. *Apus*, the armored shrimp, is at the left, and the other creature is a closely related phyllopod called *Thamnocephalus platyurus*

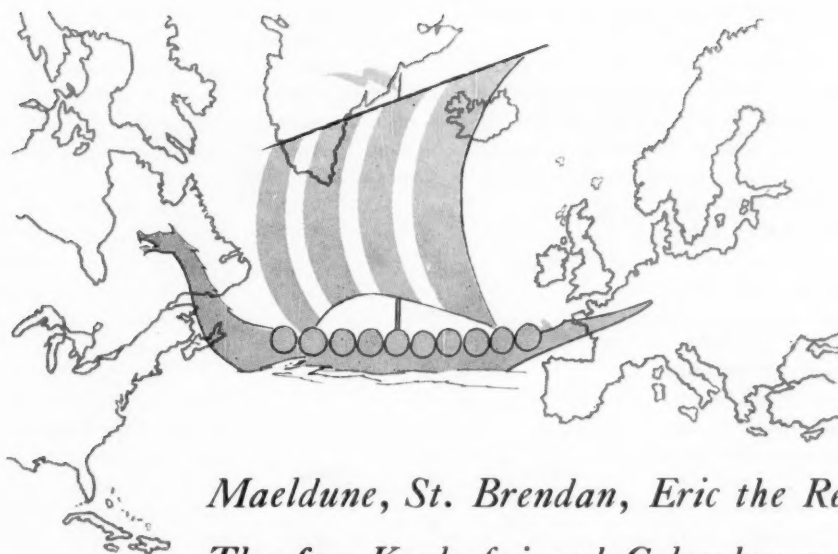


possibilities excite the imagination. Eggs may hatch, and adults thrive in waters approaching temperatures as high as 90 degrees F. Some members of the genus *Apus* do, however, have the ability to tolerate lower temperatures. Often males are entirely absent from *Apus* populations. During our studies of the shrimp population in Bicycle Dry Lake we were unable to find any males of the species; egg-laying females were abundant. Oddly enough it has been reported that in Africa males predominate in the populations of this crustacean oddity. Once the eggs hatch, growth is rapid; egg-laying adults can be found within two weeks after hatching occurs. Each female liberates hundreds of scarcely visible pinkish eggs. Two kinds of eggs may be produced. One kind may hatch at once, while a strongly "shelled" egg must be first dried then wet again before hatching will occur. In some *Apus* freezing seems to be an alternative to drying as a prerequisite for hatching. The necessity for drying seems

to be Nature's way of insuring that some of the species will survive the drought that is typical of their habitat. The legacy of eggs may be entombed in dry mud for several years awaiting the reviving bath of water, which initiates their short span of active life.

Few enemies trouble the armored shrimp. This is not because of the protection afforded by its shield for the vulnerable abdomen is left unprotected. Since this animal lives only in areas that are dry for long periods of time there are no fish to bother them. *Dytiscus*, the predacious water beetle, sometimes attacks these armored phyllopods, and ducks and shorebirds may feed upon these tasty morsels. In parts of Mexico man nets and eats them.

The conditions under which *Apus* thrives are similar to conditions that were widespread on earth during the Triassic period when the armored shrimp was abundant. At least part of the Triassic seems to have been a time of alternate deluge and drought. (continued on page 52)



*Maeldune, St. Brendan, Eric the Red,
Thorfinn Karlsefni and Columbus were*

First American "Bird Watchers"

By JOHN B. MAY

Illustrated by Terry Fleischman

WHO WERE the first Europeans to observe the birds of North America? What birds did they see, and where did they see them? These are questions that may well be of interest to the bird watchers of today.

Although Christopher Columbus was not the first European to cross the Atlantic, he was the first to have his travels properly publicized and to have his discoveries recognized as of real importance. Five hundred years before Columbus, the Northmen had established colonies in Greenland and were exploring the coasts of Labrador, Nova Scotia, and probably New England. Another five hundred years earlier, according to ancient Irish legends, a Celt of noble parentage made a successful, although accidental, voyage across the western ocean, and returned to have his story, embroidered and embellished, become the theme of bards and minstrels, who passed it on by word of mouth from generation to generation.

The leading character in the "Saga of Maeldune" was the son of Aillill Molt, or Aillill of the Battles, who was High King of Ireland from 463 to 483 A. D. In *The Quest of the Western World*, by Francis William Rolt-Wheeler, a late version of the saga is related. Maeldune's voyage was planned as a simple coasting trip, but because Maeldune's foster brothers insisted on joining the crew and thus antagonized a Druid, so the story goes, the small craft was driven out to sea, helpless before the strong winds from the east. The epic yarn undoubtedly grew as the years passed, as do all good stories, so that in its present form it is a weird mixture

of fact and fancy, of the possible and impossible and it is extremely difficult to decide just how much of it is founded on an actual journey. Unrecognizable islands were passed, with unbelievable inhabitants, as the minstrels' imaginations colored the tale, but among the places visited was "an island covered with birds, but in no wise harmful; an island with a monstrous beast like a horse, with long sharp nails, with which he picked up stones and threw them at the boat." Was this a walrus, scattering pebbles before it as it rushed clumsily down a sloping beach to the sea in fright? The saga goes on to describe crossing "a clear sea, and afterward to a cold and cloudy sea, and after that to a thin sea, in which the water was hardly dense enough to float the boat." Was the "clear sea" the Gulf Stream, and the "cold and cloudy sea" the fog-shrouded fishing banks off Newfoundland, or farther south? Was the "thin sea" our coastal waters diluted by the many rivers of the Low Country of Virginia and the Carolinas? The narrative becomes less fabulous and more plausible as the saga unfolds.

Beyond the three seas Maeldune found a large island, and around it were floating "great nuts, with insides white as snow." Near here he spent the winter. Later he found another island "forested with yew-trees and great oaks, and, in the midst, a little lake. . . And on that island they saw a great wonder, an aged eagle, as big as a cloud, who dipped himself once on each of three successive days in the water of the lake, and flew away, his youth and strength renewed." This "natural

history," *unnatural* though it may seem to us today, may have been founded on actual observations.

That Maeldune crossed the North Atlantic in a tiny boat before the year 500 A. D. is no more unbelievable than that the Indians of Peru may have crossed the South Pacific on a balsa raft, as demonstrated in that modern saga, *Kon-Tiki*. Today coconut palms line the beaches of the sea islands from South Carolina southward, and their "great nuts, with insides white as snow," often drop from the trees, roll down the beaches and drift long distances on the ocean. The most conspicuous trees in this coastal region are often the bald cypresses, whose short, narrow needles are strongly suggestive of the European yew-trees from which the early Celts and Britons made their bows, and the broad-spreading live oaks, with acorns and manner of growth like the sturdy English oaks.

But what about the "aged eagle, big as a cloud, who dipped himself. . . in the water of the lake"? Maeldune's Irishmen probably knew by sight both the golden eagle and the gray sea eagle of Europe, but this was something larger, although "big as a cloud" was, of course, hyperbole. Could it have been a condor? The great California condor, largest of American land birds today, and bigger than anything found in the British Isles, is limited now to a few birds in remote mountain regions of California, where it is threatened with early extinction. Within historic times its range was considerably larger, but it was definitely a "western" species. Fossil bones of this species have been found, however, in Pleistocene deposits at Sarasota and Seminole Field in Florida, and it is not beyond the range of possibility that these great birds were still to be found over much of southern and eastern North America fifteen hundred years ago, when Maeldune made his legendary voyage.

We can easily picture to ourselves the scene. The carcass of a great fish, porpoise or other creature, stranded on a bar far out in a shallow pond or tidal lagoon, and a great condor returning day after day to its feast of carrion, stuffing itself to repletion on the first two days and flying sluggishly and heavily away, as the black and turkey vultures do today. But on the third day, when only scraps of carrion are left and the condor's appetite is still unsatisfied, its greater activity suggest "youth and strength renewed." We can even speculate whether the "aged eagle" might not have been a specimen of *Teratornis*, that huge vulturine bird, far larger than the California condor, whose fossil bones have also been found in the Florida Pleistocene deposits, and which may have been seen by the ancestors of our Indians. Indeed it is thought to have been the basis for their myths of the War Eagle or Thunder Bird. At least, the "saga of Maeldune" gives us material for study of what

is, perhaps, the first mention of the bird life of the North American continent.

Less than fifty years after the voyage of Maeldune, another Irishman, afterwards canonized as St. Brendan, made a somewhat similar cruise to "the Island of the Blest." Again Rolt-Wheeler is our authority and we turn to his account to quote:

"And so they went on through forty days, and the wind driving them from the eastward. And at last they saw to the north a very large island, having hard rocks on every side, and they sailed around it for three days before they could come near any place of landing, but, at last, they found a little harbor, and landed every one. . . The next day they went back to their ship and sailed many days before seeing land, but at last they came to an island with large white sheep. There

they met an old man who told them to continue their journey till they came to the Paradise of Birds. And they went a long way through the lovely country, till they came to a very good well and a tree beside it full of branches and on every branch were beautiful white birds, so many of them that not a leaf could hardly be seen."

Here, again, it is difficult to separate fact from fancy. Was the first island Iceland, the second Greenland? Were the "large white sheep" polar bears, or were the successive landfalls Newfoundland, Nova Scotia and Cape Cod? Was the "Paradise of Birds" possibly Nova Scotia and the white birds a colony of herring gulls, or should New England claim the distinction? Fact or fancy, the "Saga of St. Brendan" exerted a real influence on the course of later discovery, for "St. Brendan's Island" is shown on many maps, even after Columbus' day, and many expeditions went in search of it. Columbus himself owned a Latin manuscript containing part of the "Saga," and he wrote in one of his notebooks regarding it, "the land of St. Brendan is the Land of the Blessed, towards the West, which no one can reach except by the power of God."

After the legendary voyages of Maeldune and St. Brendan there is a gap of half a millenium before the "Saga of Eric the Red" and the "Saga of the Wineland Voyages," which describe the explorations of the Northmen between about 900 and 1100 A. D. The latter saga narrates the journey made by Thorfinn Karlsefni and his wife, Gudrid the Fair, between 1003 and 1006 A. D., to places now identified as Newfoundland, Nova Scotia and New England. Iceland had been settled many years before this time, and colonies had been established in Greenland along the southern coast. From the latter, Thorfinn sailed along parts of the Newfoundland shore, then, after passing a land where there were long strands and sandy banks, and which was probably Nova Scotia, "they stood into a bay with their ships. There was an island at the mouth of the bay, (continued on page 52)



"The Bedtime Story Man"

By ARTHUR S. HARRIS JR.



Eighty-two on January 14, 1956, Thornton W. Burgess still writes a Nature bedtime story six days a week, adds to his list of published books, and finds joy in helping young people to love Nature.

PHOTOGRAPH BY THE AUTHOR

SOME YEARS ago it was suggested that if the children of America could choose their candidate for President, their choice would be Thornton W. Burgess, the man who has helped make children all over the world love animals.

In presenting Mr. Burgess a medal some years ago, the late Dr. William T. Hornaday, Director of the New York Zoological Society, said, "Any man who can find his way into the hearts of a million children is a genius. If he carries a message of truth, he is a benefactor. Thornton W. Burgess is both."

Eighty-two on January 14, 1956, Thornton W. Burgess is still writing daily Nature stories for a newspaper syndicate, traveling, visiting friends, and photographing wildlife. Nine million copies of his books have been sold, and his "Burgessville" characters are known throughout the world—Happy Jack Squirrel, Unc' Billy Possum, Grandfather Frog, Peter Rabbit.

The present Queen Elizabeth of England read Burgess books as a child. But his readers are by no means confined to young people. Judge Harold Medina faithfully read Burgess animal stories during recesses in a recent New York trial.

When he is not writing his stories about Bobby Coon or Danny Meadow Mouse, Mr. Burgess is an expert zoologist in his own right. He also has become an accomplished photographer, with many reels of wildlife, shot in color. Once he lectured with these movies.

I recently visited Mr. Burgess at his home in Hampden, Massachusetts, a small country town near Springfield. There are small farms in Hampden, and meadows, streams, and rolling hills. It has hardly been touched by *suburbia*.

for January, 1956

Mr. Burgess lives next to a black-topped road not far from the village. His house, built in 1732, is the oldest in town, a compact, gray-shingled home with towering elms beside it. He calls his place "Laughing Brook."

I did not find him in the main house. From early spring until late fall, the writer does most of his writing out in his barn. There he has a rustic room, screened on two sides. On one side is a small brook with a meadow beyond. At the back, behind the ice house (now a combination guest house and tool shed), is a steep, wooded hill.

Despite his age, Mr. Burgess is remarkably alert. His only concession to time is a hearing aid. Steady

"Goldy" was one of the friends of Aunt Sally Cook at her Woodhouse Night Club. [Nature Magazine for October, 1948]

PHOTOGRAPH FROM LITTLE, BROWN & CO.



work from boyhood is partly responsible for his good health, he told me, and he plans to go right on writing until he is one hundred. In his secluded barn studio, open to Nature on two sides, are the simple materials of a writer—a typewriter, a metal file cabinet, and boxes of typewriter paper.

Mr. Burgess pointed to the small brook a few feet from his writing room. " 'Laughing Brook' we call it, but during the flood this past summer it was a raging river. No laughing matter!" He showed me how the flood had swept over his land and around his house.

I told Mr. Burgess that I had remembered many of his bedtime stories from my childhood, and that I supposed people were always mentioning that.

"I never tire of hearing it. As I was telling someone the other day, Little, Brown published my first Nature book in 1910, and I've been with them ever since, longer than any writer on their list."

In addition to nearly a hundred books, I knew he had been writing a daily syndicated bedtime story for many years. I asked him how long.

"A story a day, except Sundays, since February 17, 1912," he said. "That's forty-three years." He moved to a file cabinet. "I'm not ordinarily a methodical man, but you see I do keep these stories numbered. They are up in the thirteen thousands now."

I asked him how he started. He told me that, years ago, he had been making up short stories about animals to entertain his young son, Thornton W. Burgess, Jr. When the boy was five years old he visited his grandmother. Father Burgess started writing out his daily stories and mailing them away so the youngster's grandmother could read them to him. In 1910 the stories came to the attention of Little, Brown; they published the surprisingly successful *Old Mother West Wind*.

Mr. Burgess suddenly stopped talking to me and pointed to a tree beside his brook. "Look," he said, "feeding her young." And I looked behind me to see two blue-jays on a nearby tree, attracted by the food put there for them.

Then his attention shifted to another tree. "See the woodpecker there!"

We watched them in silence. "Always something to see from here," he said. "I'm going to have this porch glassed in so I can stay here later in the fall." He explained that he now spends his winters on the Island of Tobago near Trinidad, but soon he expects to live year-around in Hampden.

I brought the conversation back to the Burgess animal stories. "I suppose the real appeal of your stories is that you personify the animals, is that it?"

"Others have done it," he said. "But I like to think that *truthfulness* has helped me most of all. Some writers, you know, have animals riding bicycles and doing all sorts of things. Except for giving the animals names—and every child names his dog or cat—and making them articulate, I have always been truthful to Nature; to the facts."

"I once wrote a story about Chatterer the Red Squirrel stealing corn from a crib and hiding it. I got an indignant letter from a man in Ohio. He said it was nonsense, his red squirrels would never do such a thing. I asked him for more details and found that there were no red squirrels there, but a red form of the fox squirrel."

When he started writing the stories, Mr. Burgess explained, he did not regard himself as a naturalist. He



PHOTOGRAPHS FROM LITTLE, BROWN & CO.

Aunt Sally and one of her raccoon friends that came for a nightly handout. The story of these animals is told in Thornton Burgess' *Aunt Sally's Friends in Fur*

was simply a man who liked woods, meadows, and the beaches, marshes, and sand dunes of his native Cape Cod. Most of what he knew of animals he had learned from personal observation. He did not know even one zoologist.

As the years went on Thornton Burgess learned more and more. He studied the habits of field mice and raccoons and skunks in the fields and woods of Longmeadow. Gradually his large house on Washington Road, adjoining Forest Park in Springfield, began to be filled with books about wild animals. Besides his fiction, he wrote a number of factual books, including *The Burgess Animal Book for Children*, *The Burgess Seashore Book for Children*, and *The Burgess Flower Book for Children*.

The titles of these books lead us to think of children. Burgess said he hopes the television people will not forget that one of the best ways to reach children is

through animals. "In some way children feel just a little superior to wild animals," he explained. "It's something they feel instinctively. You can use this feeling to teach them."

I asked him how.

"I don't know how child psychologists handle it. I had a woman telephone me from New York one day. She said her little daughter was afraid of the dark and wouldn't go to sleep. She wanted to know what I

from wild animals. When a boy in Iowa heard that Jerry Muskrat left air spaces when he built his home, he no longer objected to the window being open at night—according to one mother's enthusiastic letter.

"I *hope* I've taught children something, mostly by indirection. When I talk to them at schools and Scout meetings, my approach is different. There I'm not so much using the fable as simply showing them how tame and gentle most wild animals are if approached in the right way. Sometimes it bothers me to see grownup people at zoos trying to excite or tease the animals; even a docile animal resents waving arms and that sort of thing."

To prove how congenial animals can be if properly approached, Mr. Burgess gave me a copy of his most recent book, *Aunt Sally's Friends in Fur*, which I read that night. It is a little book with two dozen remarkably good animal photographs done with the Burgess Graflex.

The book proves that patience and naturalness pay off in observing animals. "Aunt Sally," one of the older residents of Mr. Burgess' home town on Cape Cod, told him once that during the warm weather skunks paid nightly visits to her woodhouse. What is more, she reported, they were completely trustworthy and so friendly they often climbed into her lap and enjoyed being stroked.

As a close observer of animals, the skunk had long been one of Mr. Burgess' favorites. Half jokingly he had once said that a skunk would make a better national symbol than an eagle because it was armed for defense, rather than offense. Skunks were nearly always gentlemen, and Mr. Burgess had often advised nervous telephone callers how to handle Jimmy Skunk.

So Thornton Burgess came one night to "spec-tate"—as Aunt Sally would say—at the woodhouse. Even his flash bulbs did not frighten the skunks. He photographed them in Aunt Sally's lap. Night after night Mr. Burgess quietly watched the skunks come into the woodshed, eat, climb into a lap, and be stroked. Then a raccoon came, and later more raccoons. Finally the skunks gave up altogether.

During the evenings, as Mr. Burgess and his friends watched and photographed the visiting skunks and raccoons, they learned much. As he wrote of the raccoon: "Another very general belief the night club proved to be wholly erroneous is that raccoons *always* wash their food before eating. Nothing could be further from the facts."

Thornton Burgess has worked hard since he was ten. His father died when the boy was nine months old, and young Burgess helped his widowed mother. He mowed lawns, picked berries, shoveled sidewalks in winter, chopped wood. Later he grew tired of his job in a Boston shoe store, went to work with an advertising agency as a copywriter, then into magazine publishing, eventually becoming an associate (continued on page 52)

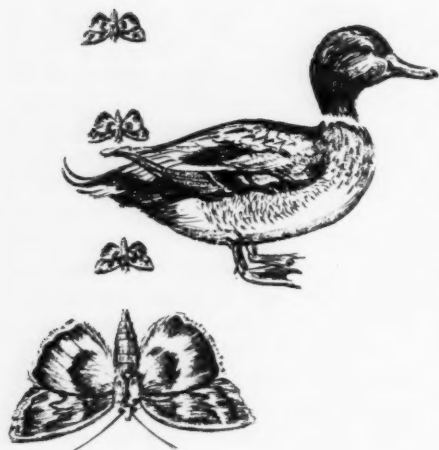


Thornton Burgess gets acquainted with one of the skunk visitors to Aunt Sally's Woodhouse Night Club. Mr. Burgess suggests that the skunk would be an appropriate national emblem since it is armed for defense, not offense.

could do.

"Well, I got busy right off writing a little series about timid animals—Whitefoot the Wood Mouse, I called one of them. He wasn't a bit afraid of the dark. A few weeks later the mother called me up and said the stories had done the trick. Her daughter wasn't going to fear the dark now, not if Whitefoot the Wood Mouse didn't."

As natural imitators, Burgess went on, children learn



Ducks, Moths, Cabbages and Catastrophe

By TOM MORRILL



THERE is a marvelous determination in commonplace plants and animals to live beyond catastrophe. As son of a scientist father who taught his children the worth and wonder of Nature, and as a biologist school teacher trying to teach this same appreciation, I have been struck many times with this fundamental will-to-live. I remember especially a boyhood pet, a hen mallard.

She was an extraordinary egg layer, and had laid one hundred and eight eggs in one hundred and twelve days when the pen gate was left open one night. Next morning the other ducks were wandering peacefully about the yard; the mallard was gone. I hunted most of the morning before finding the place where she had died. Hidden in the weeds of the vacant lot next door was a pile of feathers torn from her body as a dog had killed her. Unbroken in the circle of feathers, as though gently laid in a nest, was her last egg.

My father sometimes brought home cocoons of wild silk moths so that my brother, sister, and I could enjoy the emergence and adult stage of these beautiful insects. After we were tired of admiring them, the moths were usually put in a shoebox, there to spend the brief remainder of their lives. Occasionally we opened the box to look at them. I shall never forget finding the moths, wing-tattered and stiffly dead at last, and nearby, laid just before they died, glistening in pristine newness, their strings of pearl-like eggs.

These childhood experiences were recalled to me not long ago when I observed another simple living thing's powerful struggle to survive itself, this time a cabbage. From the garden I had pulled up a Chinese cabbage, a Crucifera, although more resembling celery in size and shape. After the roots were cut away and the coarse outer leaves—about a third of the head—removed, the upper half of the remainder was sliced off for salad. What was left was put in the refrigerator wrapped in wax paper.

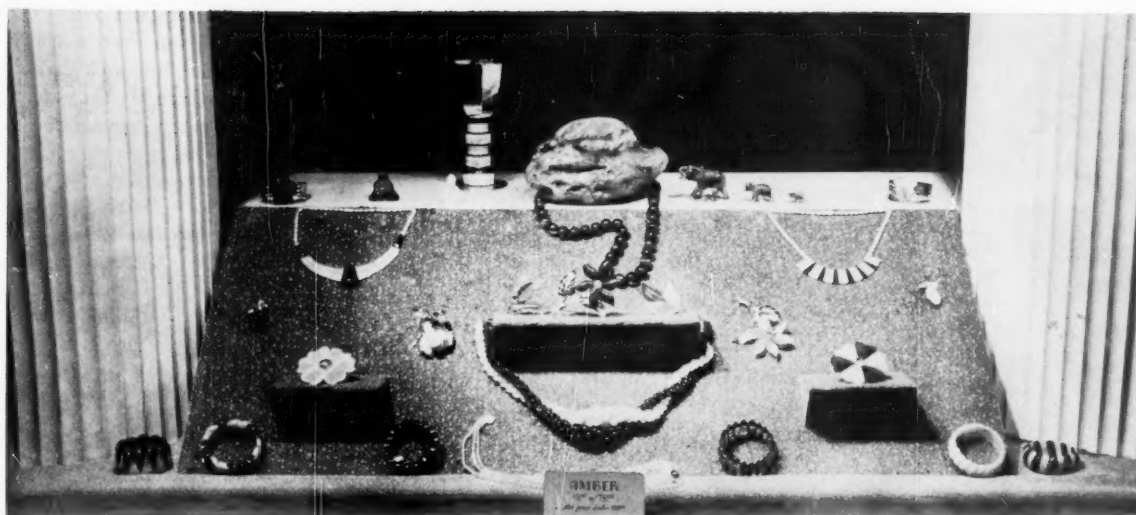
A week later I had a knife poised to make more salad when I noticed a strange alteration in the previously straight-cut end. Now the central core protruded about half an inch beyond the enclosing leaves. Placed up-

right on the kitchen window sill the core continued to grow for a week, producing four flower stalks as long as itself. Then while the leaf stumps withered to parchment, above them the yellow flowers bloomed in perfection and profusion.

A final example of commonplace life's will-and-means-to-live—an experience that brought to consummation a long-felt urge to write this article—occurred recently with the trapping almost uninjured of a western pocket gopher in the back lawn. Since the gopher was large and full of fight I decided to give my three month's old pup her first lesson in attacking something more ferocious than a dog biscuit. When the rodent was released the dog immediately attacked its head. For the next ten seconds the gopher flew through the air, fastened by its big incisors to the yipping pup's nose. Subsequently the dog was content to maul the gopher's rear quarters, that with much caution.

The mauling went on for ten minutes or so, the dog barking frenziedly, leaping in and back, as it circled the gopher, which turned to face its tormenter, sometimes standing on hind legs, gritting its teeth in defiance. Finally, however, the gopher ceased its maneuvering and any resistance except to turn its teeth on the dog when her mauling amounted to biting. But now the gopher did something totally unexpected, something that at first made no sense. Was the hapless creature indulging in "escapism" to allay fear? Whenever the dog left off mouthing it, wherever it landed, methodically and with discrimination the gopher began eating tender leaves of clover!

Then as I stood in troubled puzzlement searching futilely for the answer in my own human experience, the light of Nature's essential healthfulness shone through. This was the farthest thing from a sickly escapism. The animal had been in the trap for several hours. Where the dog's mouth had wet its body, I could see the sunken flanks. Despite its alien surroundings above-ground the dog's teeth and incessant point-blank barking, life was going on for the little pocket gopher. In spite of the worst terrors that could befall (*continued on page 50*)



A piece of rough, unworked amber surrounded by various pieces of jewelry and decoration made from this gem material, which, with the diamond, is of vegetable origin.

Amber, "Gem of the Ages"

By PAUL JENNINGS

SOME YEARS ago—science says about sixty million—a hitch-hiking flea was enjoying a ride on a dinosaur slogging through a primeval swamp in the Baltic Sea region. Assailed by hunger, the brash insect essayed a nip of dinosaur blood.

This was a mistake. The flea's ungainly mount bucked viciously, unseating the passenger, who landed in a mass of resin oozing from a giant tree that had been rent by lightning. There he was trapped like a fly on flypaper, and therein hangs a fascinating tale. Today the unwise flea is securely entombed in a lady's beautiful amber ring, plainly visible and as lifelike as the day he met his doom, some sixty million years ago.

No other gem is so rich in history and legend as amber. It and the diamond are the only gems of vegetable origin. Amber was highly prized by the ancients, as much for jewelry as for the magical properties attributed to it. The Greeks noted that the fossilized resin acquired a charge of negative electricity when rubbed on cloth. Their word for amber was *elektron*, from which stemmed our word *electricity*.

Amber is the national gem of Latvia. It is recognized as designating the tenth wedding anniversary. According to a charming tradition, an amber necklace, when presented by the swain to his bride-to-be on their wedding eve, will keep her the most beautiful of all women in his eyes.

John W. Baer, an amiable, mild-mannered electrochemical engineer, is perhaps the greatest living authority

on the "gem of the ages," as amber is known. As head of the Amber Guild, Limited, a New York corporation, he is "Mr. Amber" to the jewelry trade. His company controls all imports of Baltic amber to this country, and makes or imports most of the amber jewelry sold here. He would rather talk about his hobby and business than eat.

"True amber is the fossilized resin of a pine-like tree called *Pinites succinifera*," he will state with little or no urging. "It was as large, if not larger, than our California redwood trees. Forests of these stately trees abounded in the Baltic region during the Oligocene era.

"At that time, the icy and turbulent Baltic Sea was as warm as the southern Mediterranean of today. Then came the glacial ages, which swept this floral splendor into oblivion. The golden sap of those prehistoric trees, hardened by time, temperature and great pressure, is our magnificent amber."

As he spoke, Baer fondled a chunk of raw amber the size of a grapefruit. In its clear depths could be plainly discerned a couple of cockroach-like insects, bits of leaves, twigs and other flora and fauna that flourished in the forests of the period.

"A rare museum piece," he said, explaining that it was too rare to be fashioned into jewelry for milady. On his working table reposed a glittering array of amber jewelry produced by his own and European artisans, whose craft has been handed down through the years from father to son. There were rosaries of clear golden,



Mrs. Martha Smith and Mr. John W. Baer, authority on amber, admire one of the largest pieces of amber ever found.

transparent beads, earrings in every hue, from water white to black, cloudy buttercup yellow, rich antique brown. There were bracelets, necklaces, pins carved delicately in the shapes of leaves and fishes, and "insect rings" in which the gem contained a perfectly preserved insect.

Although beloved by connoisseurs and collectors, amber jewelry is within the reach of the most modest purse. A pair of earrings may be obtained for as little as four dollars. Prices range from there to several hundred dollars for pieces in which an insect or unusual floral specimen is imbedded.

"At one time, wealthy patrons would pay almost any price for amber nuggets on which Nature had chosen to implant certain initials," Baer said. "One of these was Frederick William I of Prussia, who was entranced when a dealer offered him an authentic gem on which his initials appeared through the courtesy of Nature."

From earliest times, superstition has played a large role in the story of amber. The ancients, and many people even today, held that wearing an amber necklace would ward off disease. "Mr. Amber" wonders, with tongue in cheek, if this superstition might be connected in some way with an unusually heavy demand currently for amber cigarette holders and pipe stems.

"As a matter of fact," he continued, "amber does have a use in medicine. Human blood will not coagulate quickly if kept in amber containers, which are standard equipment in many hospitals and laboratories.

"The belief in the therapeutic properties of amber in helping to prevent and cure goiter and arthritis, when worn as a necklace and bracelet respectively, exists to this day. I have known many people who swear that they have 'cured' their goiters by this method, reducing the swelling that characterizes the affliction. As we

know, amber has the property of slowing up the coagulation of blood, and that it has a tremendous capacity for building up a charge of static electricity. Who can say that there may not be some relationship between these properties and the healing of disease?"

Baer first became interested in amber during his career as an electro-chemical engineer and because of its value in the field of electrical insulation. "Amber has the lowest surface conductivity and the highest surface resistance," he said. "It is important, therefore, in X-ray therapy, delicate electrical measuring instruments and scientific research laboratories."

In earlier days, when violent storms agitated the Baltic Sea, peasants flocked to the beaches to recover the treasure of amber cast up by the waves. Being just above the specific gravity of water, any turbulence would set it adrift from the bottom of the sea and wash it ashore in quantities.

Today, however, amber is mined commercially in much the same fashion as diamonds or gold. It is found in the "blue earth," a layer of sticky, hard material with the consistency of clay. This amber-bearing blue earth is found under several layers of soil dating from the Oligocene period down through the Miocene, the Pleistocene and, of course, the layer of earth of comparatively recent origin. The amber washed ashore is believed to come from similar layers of blue earth exposed at the bottom of the Baltic.

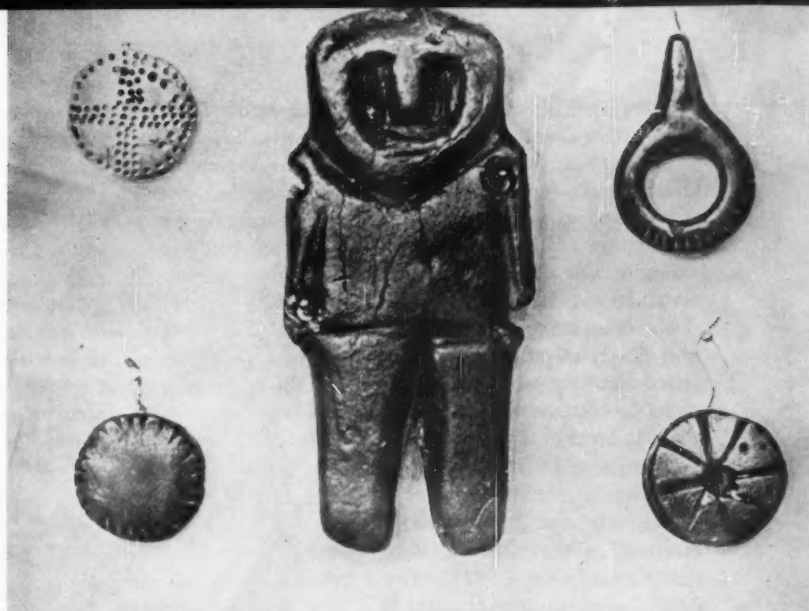
Giant steam shovels dig away the more recent layers of soil until the blue earth is exposed. It is scooped up and taken to rooms where powerful jets of water separate the amber from the soil. Only about twenty percent of the amber recovered is suitable for making into jewelry. The remaining eighty percent is melted into an industrial product, succinic acid.

"During the washing operation, careful watch is kept for specimen pieces containing insects, flowers or other matter valuable as scientific specimens and for carving into the more costly jewelry pieces," Baer explained. "These prize pieces are becoming increasingly rare, and I foresee the time when an insect-containing piece of amber will rank in value with the most costly gems, because of their rarity."

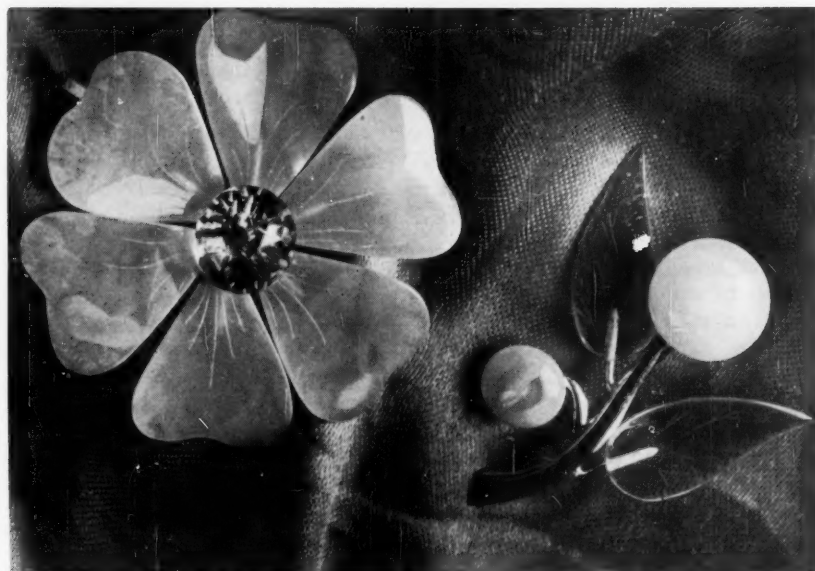
The famous Amber Guild Collection of museum specimens is priceless in that no accurate appraisal of its worth can be made. It simply cannot be replaced. The collection has been displayed in many museums and in the finest jewelry stores all over America, and is partly responsible for today's vogue for amber jewelry. Incidentally, whereas the golden transparent amber known to most people was once the favorite, the fashion now is for the cloudy, opaque or solid colors, ranging from pale lemon-yellow to rich orange-red and golden-brown. It may be clear, translucent or densely opaque.

The collection consists of more than a thousand of the

At right are examples of amber craftsmanship of the period before the dawn of recorded history in Europe. The good condition of these objects is proof of the durability of amber, one of the earliest gem materials used by man.



Below, details of two amber lapel pins made by Amber Guild craftsmen. At left, note the faceted center portion of the flower. At right, amber flowers and leaves are mounted on a sterling silver stem to form a striking combination.



rarest specimens in existence. It contains some of the largest specimens ever found, with perfect examples of each shade and color. There are specimens containing a drop of water, leaves, foliage, plant life and more than a hundred species of insects that lived more than sixty million years ago, as well as wood from the extinct amber tree.

Fabricated specimens include a silver plate inlaid with amber mosaic, an amber and silver chalice, amber boxes in many shapes and sizes, carvings in the likenesses of elephants, Buddhas, bears, ships, turtles, etc.

Although the creation of intricately designed amber jewelry requires skilled craftsmanship, the raw gem is fairly easy to work into shape. The tools commonly used include diamond wheels, jeweler's saws, tiny files and special knives.

As with all precious gems, there have been unsuccessful attempts to produce authentic substitutes for amber.

"Although no longer common today, there was a time, with the advent of plastics, when attempts were made to pass off plastics for amber," Bayer said. "As a matter of fact, at least one important aim spurring work in the development of plastics, was to find a substitute for amber for pipe mouth-pieces.

"However, it isn't difficult to distinguish amber from imitations. It is the only gem that is warm to the touch. Known as 'the gem you love to touch,' it has a unique and unctuous feel. Amber is the lightest of all the gems, and has a much

lower specific gravity than imitations. It will not dissolve in sulfuric ether, like copal and the natural gums. Also, when freshly cut or ground, amber emits a distinctively characteristic pleasant, clean, camphor-like aroma. Recognition of this phenomenon was responsible for the use of ground amber in expensive oriental incenses."

Other tests to tell the true from the false include measuring the specific gravity. The specific gravity of amber is 1.07, as compared with 1.025 for sea water. Thus it is nearly buoyant, which accounts for the harvest sometimes washed up on the Baltic beaches during heavy storms.

Amber is without doubt one of the earliest forms of jewelry. Amber beads figured in prehistoric burials of the Bronze Age. Amulets of amber have been found in East Russian tombs that date back to the Stone Age. Other pieces were brought to light when tombs in the

ancient city of Mycenae in Greece were excavated. These represent an almost mythological period.

The Empress Poppaea set the vogue by having amber jewelry made for herself. Nero gratified the demands of the Roman dames for this new ornamentation by dispatching an expedition for it. Wines the color of amber became the rage, and women dyed their hair to match its beautiful shades.

Christian martyrs went to their deaths against a glittering background of amber. The nets that protected Nero's parapet in the arena from the onslaughts of wild beasts were studded with it. The weapons of the gladiators of those days were decorated with amber.

The "gem of the ages" has long figured in literature. It aroused the special ire of the testy old Roman colonel, Pliny the Elder (A.D. 23-79). Disdainful of anything that could be termed a luxury, he spoke scathingly of amber as representative of the frivolities and morals of his time.

"So highly valued is this bauble as an object of luxury that a very diminutive effigy made of amber has been known to sell at a higher price even than living men in stout and vigorous health," he ranted. Pliny even attacked the Roman ladies' fondness for the "new" shade of hair dyeing, "amber-color"—a fad no doubt inspired by the blond hair of Germanic girls who were brought to Rome in chains as captives.

Another Roman authority of Pliny's day was Callistratus. He maintained that amber, "worn as a collar about the neck, cures fevers and heals diseases of the mouth, throat and jaws. Powdered and mixed with honey and oil of roses, it is an excellent remedy for diseases of the ears. Compounded with the finest Attic wine, it is an excellent eye salve improving dim sight; and pulverized and taken alone as a medicament, or drunk in water with mastic it is an excellent remedy for all diseases of the stomach."

Again—"worn about the neck, amber beads are good for all ages, protecting the wearer from fantastic illusions and fears that drive one out of his senses; further, amber, whether taken in drink or hung about one, cures strangury."

Further claims for amber's curative properties are found in Nicols' *Lapidary*, published in 1652. "The white amber is astringent and temperately hot, the yellow amber hotter," it is noted. "The white odoriferous amber is best for physick use, and thought to be of great power and force against many diseases, as against the Vertigo and Asthmatic Paroxysms, against Catharres and Arthriticall pains, against diseases of the stomach and to free it from stuffings and putrefactions,

and against diseases of the heart, also plagues, venoms, and contagions. Florentine Physicians are wont to prescribe some few drops of its oyl to be taken in wine for these purposes. It is used either in powder or in oyl, or in Troches either in the distempers of men, or of women, either married or unmarried, either with the childe or without, or in the distempers of children." Whew!

The insect and floral inclusions found in amber have been of inestimable aid to scientists tracing the evolution of insects and vegetable life through the ages. Amber is the one "safe deposit box" where these specimens have been preserved intact for from 30 to 90 million years. Entomologists have been able to classify these insects

so exactly that they can be compared with those of today. The insects preserved in Baltic amber are similar to those now found in the temperate regions. The ants were most abundant during the era in which amber was being formed. One genus first discovered in Baltic amber has been found to have modern descendants living in Malaya. Certain embedded parasitic wasps now survive only in Australia and South Africa. The insects commonly found in amber include ants, beetles, flies, wasps and bugs.

The introduction of amber to the United States is of comparatively recent origin. The production of the raw material

was originally a German monopoly. Later it was turned back to private enterprise in Europe. A European combine was formed to set up foreign offices to develop a demand for amber jewelry outside Europe.

An American subsidiary was established in New York in 1912. It was not until 1936 that Mr. Baer became interested in the industry from the technical viewpoint. He made a trip to England, France, Germany and to the Baltic as an official of Amber Mines, Inc., of New York, completing a world-wide technical and sales survey in consultation with French, British and German executives. He returned in September, 1939, just in time to escape being caught in the madness unleashed by Hitler and the Nazis.

After the vesting of the corporation because of some German stock ownership, Mr. Baer continued as president, operating Amber Mines, Inc., for the U.S. Government until the entire corporation was offered for public sale.

When the sealed bids were opened, Mr. Baer's bid, reflecting his expert knowledge of amber and its world-wide markets, was more than twice that of the nearest syndicate. Today, Amber Mines, Inc., is a subsidiary of Amber Guild, Ltd.

Born in Long Island City in 1902, John Baer attended the City College of New York, and (continued on page 50)

OF A NEW MASTER

*Our eyes are grooved in Art's persuasions till
Bold innovators are most grudging met.
The Art of Rembrandt and Da Vinci still,
With old-time Masters hold us loyal yet.
In all humility, may I remind,
The world has now, a Master unexcelled,
Whose medium of quite another kind,
Shows masterpieces not till now beheld.
His easel is a motion-picture screen,
Where Nature colored, blown to giant size,
Reveals astounding facts, so seldom seen,
We almost doubt our own trustworthy eyes.
Art's legacy is priceless to Art classes;
But Disney paints his Nature for the masses.*

Edward McNamee

Marine Mammals

By E. LAURENCE PALMER

This is the eighty-fourth in NATURE MAGAZINE's series of educational inserts.

NO MATTER what your interests may be, the animals considered in this special insert may relate to one of them. If you seek adventure, whaling and stories of whaling should more than satisfy your appetite. If you are inclined to literature you will find in *Moby Dick* a masterpiece of storytelling. Should you be interested in interpreting *The Bible*, in terms of what we now know about the world in which we live, the story of Jonah's experiences may provide a real challenge to your reasoning power, your credulity and your common sense.

Are you primarily interested in history? Then read of the rise and fall of the economy of various parts of the world as man "developed" his marine mammal natural resource. Does folklore and fantasy have its appeal to you? Then look into the folklore of mermaids, with particular attention to the manatee and its early impressions on the human race. If you have great faith in science and the scientific method, then discover how early scientists were fooled into believing that there was such a thing as a unicorn. Do you seek something that will appeal to the children? Then read Kipling's *Just So Stories*, and his observations on "How the Whale Got His Throat." Or go to the movies and see and listen to Walt Disney's singing whale, "Willie."

Although I was in the Navy in the first World War, I never saw the sea until long after; that is, I never saw it from an off-shore vantage point. Since then I have seen whales and seals in many parts of the world, smelled them when they were being processed into soap and other products of industry. Once I dug from wet, slippery, green clay, deep in a little canyon in Arkansas, the only vertebra of a species of fossil whale ever found in that State, and the northernmost record for that species. With rather poor success, but without complete failure, I have sought manatees in Jamaica, Cuba and Florida. I never miss the chance to see a picture on whaling, and when I do see one I rarely fail to wish that something could be done to improve our attempt at coexistence on the earth between man and the mammals of the sea. I am sure that I am really quite a landlubber, but these marine mammals always interest me. I am reasonably sure that others share my feelings. Frequently I have a derring-do desire to get out and know these animals better, but find little opportunity to satisfy this urge. If, however, by writing an article such as this I can



Cow



Hair



Bull

Fur Seal

interest others in these animals, and in the problem some of them face if they must survive, possibly I can make some contribution. As a matter of fact, I rather suspect that the future of these animals lies more with the landlubbers than with the old salts.

Simple Simon went fishing to catch a whale in his mother's pail. Nowadays, to catch a whale, you have to have a whole fleet of special ships and such ships cost a lot of money to own and operate. Money is provided by those who find profit in its investment. Chemists and others are constantly devising substitutes for the materials we formerly got from whales and seals. These animals' ability to bring wealth to their

harvesters nearly led to extermination of many species, and might even yet do that. So important was this activity that wars between nations came about because of these animal resources. International agreements regulating the harvesting of seals and whales became necessary. Let us hope that research and regulation will allow these animals to regain something of their former abundance on the earth.

It should not be necessary to repeat here the material to be found in the chart section of this insert. The basic material for understanding these animals of the sea is succinctly presented there.

This unit might be considered a companion piece for the 74th insert, which dealt with large marine fishes. Other units in this series that should help one to appreciate the sea might include #8, Marine Animals; #10, Atlantic Coast Shells; #34, Pacific Coast Shells; #38, Marine Algae; #62, Sea Birds. We already have material prepared that can expand on some of the units that have already appeared without using the same species there considered.

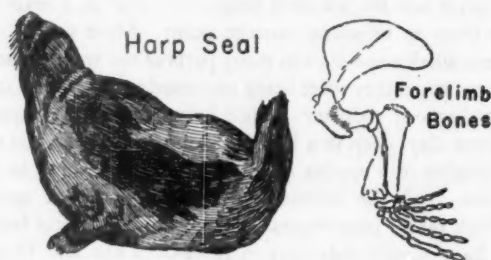
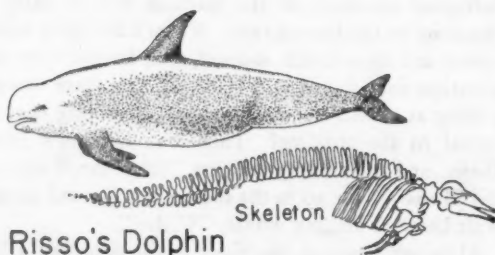
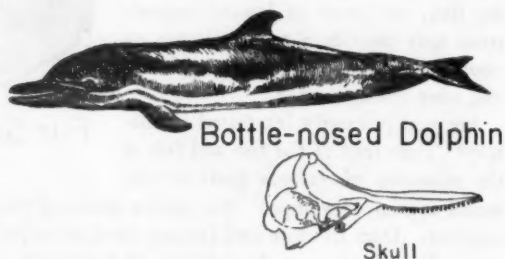
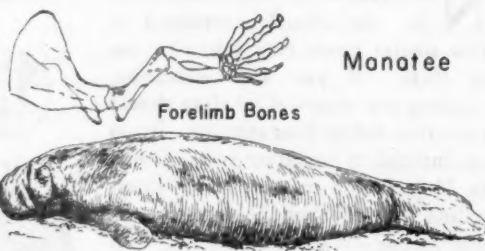
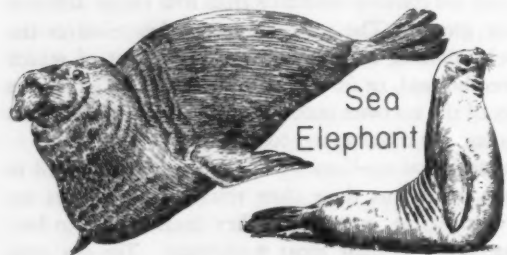
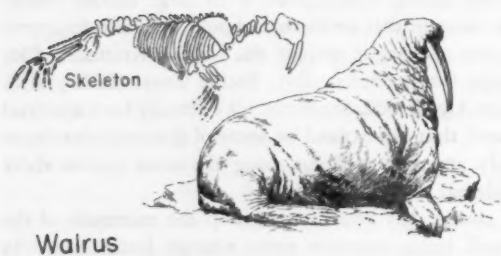
Of course, any attempt to group the mammals of the sea will bring together some strange bedfellows. In this unit we consider mammals from four rather different genetic groups. The sea otter has as his relatives the weasels, skunks, badgers and the like, most of which live on the land, or in or near fresh waters. The marine habits of the sea otter makes it quite an individualist, so far as its near relatives are concerned.

The seals and sea-lions are not too remotely related to the sea otter, but their close relatives are almost exclusively marine, except that they come ashore to bear young, often to their great misfortune. The sea otter

may bear its young while at sea.

The other main group of animals with which we deal here are only remotely related to those just mentioned. The whales, dolphins, porpoises and the like could not come ashore to bear their young if they wished. Their bulk is such that they must live a watery life. While the members of this group cannot come ashore as do the

seals and their kind, they can for the most part dive to greater depths than can the seals. The story of how they are able to do this is touched on in the chart section. These mammals are for the most part truly marine. A few may run up rivers and bays into brackish waters, and a few may enter fresh waters temporarily, but these are the exception.





Gray Seal



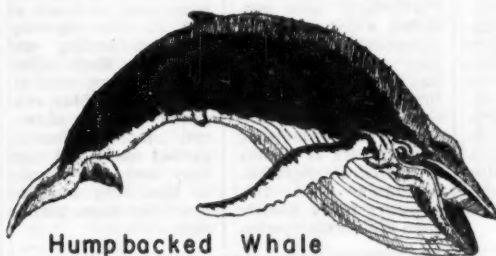
Harbor Seal



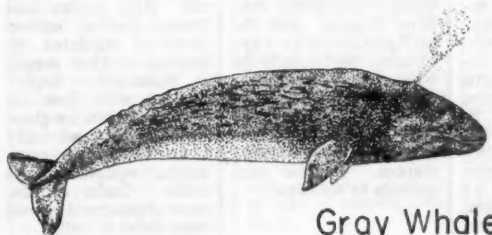
Bearded Seal



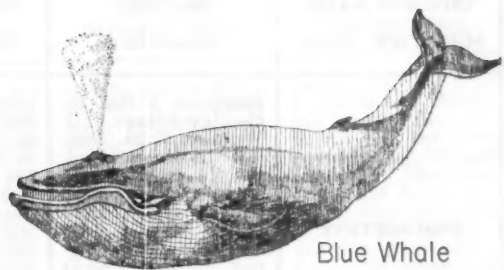
Narwhal



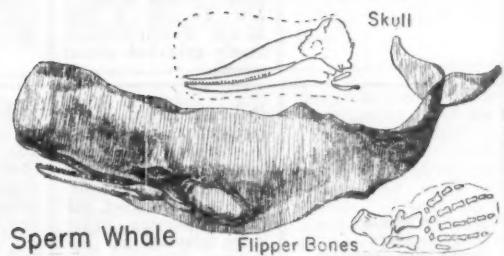
Humpbacked Whale



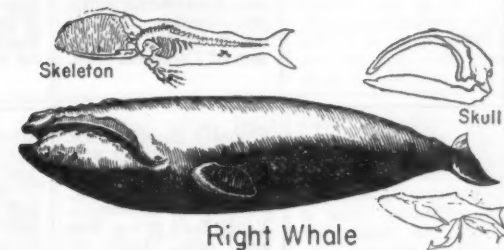
Gray Whale



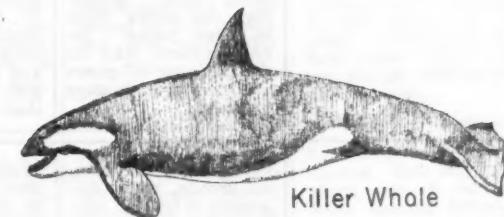
Blue Whale



Sperm Whale



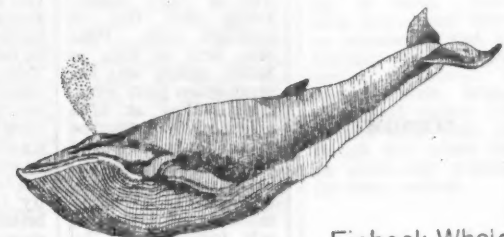
Right Whale



Killer Whale



Pilot Whale



Finback Whale

COMMON NAME SCIENTIFIC NAME	SEA OTTER <i>Enhydra lutris</i>	FUR SEAL, SEA BEAR <i>Callorhinus alascanus</i>	STELLER SEA-LION <i>Eumetopias jubata</i>	WALRUS <i>Odobenus rosmarus</i>
DESCRIPTION	Length to 5 feet, including 1-foot tail. Weight to 80 lbs. Forelegs 11 inches, hindlegs 15 inches. Feet webbed. Toes hooked on front feet. Height to 19 inches. Body full, deep. Ears narrow, pointed. Eyes prominent, large, liquid. Teeth blunt, I 3/2; C 1/1; P 3/3; M 1/2. Brown to black, finely grizzled about muzzle.	Length to 8 ft. for bull, with 2-in. tail; to 50 in. for female. Weight to 600 lbs., female, to 100 lbs. Ears, 2-in. long. Eyes, large and watery, with dark iris. Bull black with gray cape. Female mostly gray, but lighter beneath. Flippers and young black. Teeth, I 3/2; C 1/1; P 4/4; M 1/1.	Length to 13 feet. Female the smaller. Weight to 1 ton. Shoulders heavy. Hind flippers can be flexed forward. Forelimbs and hindlimbs nearly equal in length. Teeth of Steller sea-lion I 3/2; I 1/1; P 4/4; M 1/1; of California sea-lion I 3/2; I 1/1; P 4/4; M 2/1. Cal. sea-lion to 600 lbs. instead of to 1 ton, and with prominent crest.	Length, bull to 11-16 ft.; cow to 8 ft. Weight to 3000 lbs., with cow 2/3 that of bull. Almost hairless but cow with haired upper lip. Skin 1/2 to 3 inches thick. No outside ears. Tail 4 in. long and at base 6 in. wide. Height to 4 ft. Muzzle short; mouth wide; tongue 1 ft. long. Teeth, I 1/0; C 1/1, P 3/3, M 0/0. See below.
RANGE AND RELATIONSHIP	Order Carnivora. Family Mustelidae. Related to weasels, skunks and minks. Formerly ranged through North Pacific. Once nearly extinct, but now recovering under strict international protection. Was once considered extinct. Subspecies, 2, with larger southern reaching total 6 feet in length. May be seen off California coast.	Order Carnivora. Family Otariidae. Includes sea-lions, <i>Zalophus</i> ; Steller sea-lions <i>Eumetopias</i> ; fur-seals, <i>Callorhinus</i> . Related to southern fur-seal, to 450 lbs, and S. African cape seal, to 800 lbs. <i>Callorhinus</i> from Pribilof Islands in Alaska south to parallel to California. Eared seals have external ears.	Order Carnivora. Family Otariidae. Related to haired seals, the Phocidae. California sea-lion ranges along Pacific Coast north to San Francisco. Steller sea-lion along whole coast of Pacific United States, Canada and Alaska. Usually found relatively close to rocky shores. Both genera found along California shores.	Order Carnivora. Family Odobenidae. Atlantic walrus, <i>O. rosmarus</i> , Arctic seas from ice south to Labrador. Pacific walrus, <i>O. divergens</i> , Arctic seas and Pacific south to Pribilof Islands. Both species make northern migration in May to July, and southern migration in fall. Atlantic walrus has been found south to Gulf of St. Lawrence.
REPRODUCTION	Probably mate for life. Breed through year, with 1 to 2 pups born 240-290 days after breeding. Courtship elaborate. Young born at sea, with eyes open, teeth all present, able to get about soon. Mother may die giving birth to large young. 1st confinement may be short. Young full grown at 6 years. Family stays together.	Mature bulls select rocky shore in Pribilofs in April-May and defend 75-250 sq. ft. Females arrive June-July, taken into harem of to 40 animals, in 2-48 hrs. give birth to pup and mate; nurse to 4 months. In Aug. virgin 2 yr. females come ashore and mate. Pups, females and bulls leave in August. Life span more than 20 years.	One bull has 10-15 cows in harem and defends this. Cows give birth to pup about 1 week after coming ashore and mate immediately. Pup learns to swim in 1 week. Bull may guard young. Interesting courtship procedure with caressing of neck and mouths. Young reach breeding age in about 3 years. Young weighs 50 lbs. at birth, to 43 inches long, chocolate brown.	Mate from May to June but sexes remain more or less separate for rest of year, except for young that may stay with mother two years. Gestation period 330-360 days. Young may ride on back of neck of the cow. Teeth of young differ from adults as shown above, and are I 2/2, C 1/1, P 3/3, M 2/1. Bull matures, 5-6 years; cow, 4-5.
ECOLOGY	Food chiefly abalones, sea urchins, crabs, and possibly a few fish may be collected at more than 300-foot depth. Does not drink. Speed to 10 m.p.h. May roll self in floating algae when asleep on surface to prevent drifting. Sleeps on back, floating. May use shells or stones as tools to break shell food. Remarkably clean.	At sea except during few breeding months. Bulls do not eat except during few breeding months. Food largely fish taken largely at night. May feed 50 miles off shore some thousand feet deep. Prefer surface temperature 47-52° F. Can submerge for 15 minutes. Cows come ashore over 6 week period. Gestation 330 days. Adults white whiskered.	Food largely crustaceans and small fishes. Particularly favor cuttlefish, which may color excrement red. Some may run on land as fast as a man. At breeding seasons breeders and non-breeders keep apart. After breeding season there is usually a southern migration. California coast may support more Steller than California species.	Food largely mollusks grubbed from bottom, sometimes to depth of 240 ft. In captivity feed on herring and whiting. May inflate neck and sleep vertically in water. May congregate in herds of several hundred. Become excited easily and then bray and roar loudly so that they may be heard for more than a mile.
ECONOMY	Fur of high quality rating 80% that of standard otter. Pelts once sold as high as \$2500 apiece, with average green pelts sometimes selling at \$125 apiece. Now cannot be taken legally. Greatest natural enemies are killer whales, fur seals, sea lions, and, of course, man. Restoration to safe population to be desired.	One of most valuable of animals because of superior pelt, usually taken from immature male. Twice nearly exterminated, once by Russians and once by Americans. Now harvested by U. S. under international agreement. Can safely harvest 30,000 a year by leaving cows as breeders. Killer whales, sharks and man, worst enemies. Bull mature at 6. Cows bear young at 3.	Hair and pelts of little value. California sea-lions popular and intelligent circus performers, particularly in balancing acts. Protected by law, but fishermen may control those that destroy their nets under some circumstances. Popular surf animals to tourists.	Body yields to 1 ton of oil. Hide makes best known buffing leather. Take is regulated by natives so that supply is sustained. Supply natives with flesh for food, intestines for glass, oil for light and ivory from tusks for ornaments, equipment and trade. Tusks of cow more slender and curved than those of bull.

HARBOR SEAL, COMMON SEAL <i>Phoca vitulina</i>	HARP SEAL SADDLEBACKED SEAL GREENLAND SEAL <i>Phoca groenlandica</i>	GRAY SEAL <i>Halichoerus grypus</i>	BEARDED SEAL <i>Erignathus barbatus</i>	HOODED SEAL <i>Cystophora cristata</i>
Length to 6 ft. Old bulls may weigh to 300 lbs. Cream to yellow-gray to dark brown, with brown or black blotches. Pelt poor quality. Tail to 1 in. long. Skull pointed. Dog-faced. Neck short. No external ears. Teeth, I 3/2, C 1/1, P 4/4 M 1/1. Vertebrae, neck 7, back 15, loin 5, hip 4, tail 11-15.	Length, bull to 7 ft. Weight to 800 lbs. Slender. First toe of forefoot no longer than 2nd. Bull light gray or yellow-white, with black face and brown bands from neck over shoulder forming saddle or harp. Cow smaller, dull white or straw colored with obscure markings sometimes. Teeth I 3/2, C 1/1, P 4/4, M 1/1.	Length, bull to 12 ft., cow to 6 1/2 ft. Weight, bull 600 lbs., cow 275 lbs. Bull with longer jaws. Teeth, I 3/2, C 1/1, P 3/3, M 2/2. All upper teeth are hooked and single-pointed. Lower molars are notched at base. Plain ash to dusky gray, with obscure dark spots above and on sides. Often silvery. Skin, particularly of bull, has tar smell.	Length, bull to 12 ft., cow to 7 ft. Bull may weigh to 1000 lbs. and cow is, of course, much lighter. Coarse, flattened bristles in clumps on either side of mouth give animal its name. Flippers are rather square tipped. May appear black when wet but is gray to yellow, blotched with black on back and beneath.	Length, bull to 10 1/2 ft., cow to 8 ft. Weight, bull to 1000 lbs., cow to 900 lbs., but more commonly bull, 850 and cow, 400. Blue gray above and lighter beneath. May have white or dark spots on sides. Muzzle black. Cow paler. On forepart of head on top is a portion that is inflatable. Teeth, I 2/1, C 1/1, P 4/4, M 1/1.
Order Carnivora. Family Phocidae. Hair or earless seals. Found in harbors, along shores, bays, on ice, up rivers beyond tide in fresh water or salt, in Atlantic north of Florida and Spain, in Black Sea, in Mediterranean. In Pacific, south to California from Alaska and the Pribilofs.	In Arctic seas both Atlantic and Pacific. In Atlantic found south to Gulf of St. Lawrence. Accidental in western Arctic waters on Mackenzie River delta. Reported in lists of mammals of New England, of New Jersey and of Pennsylvania. Described originally from Newfoundland and Greenland. Migrates.	Order Carnivora. Family Phocidae. One species. Found in North Atlantic being most common off coasts of northwestern Europe. Off Atlantic coast of America found rarely from Greenland and Labrador south to Newfoundland, Nova Scotia and Gulf of St. Lawrence. Accidental off coast of New Jersey. (1933)	Order Carnivora. Family Phocidae. Found in Arctic waters usually associated with ice floes and usually near land from Alaska to Newfoundland. Two subspecies, the Atlantic and the Pacific are recognized. Differences are primarily in cranial differences. Pacific Gray Seal from Alaska to the east.	Order Carnivora. Family Phocidae. Ranges from Newfoundland to Greenland and south to New England, or even rarely south to Florida. Spends summer in Greenland, where it rears its young for the most part. In the North Atlantic the hooded seal is one of the more abundant seals and is in same general area as harp seal, but herds do not mix.
Sexes mixed in winter. Bulls fight in August. Breed promiscuously in September. 1-2 pups born about 280 days after breeding in water. Pup at birth may be white, or may shed white coat soon. Suckled 2 months. Young 3 ft. long by September. Sexually mature at 2-3 years. Grows for 3 years. Life span to 19 years.	Mates in water or on land 1-2 pups born in March, each weighing about 9 lbs. at birth. Pups white for about 6 weeks, then pale gray. Young swim by April. Milk of cow has 12 times the fat and 3-4 times the protein of milk of domestic cattle but no sugar. Young doubles in weight the first 5 days after birth.	Bulls go ashore in August, fight in defense of 1/10 acre of land and mate with any cow that comes on territory. Cows not kept in harem. 1 pup born a few hours after cow comes ashore and 11 1/2 months after the breeding. Pups white, woolly, hidden in cave by cow 3 weeks, then weaned. At 6 weeks sheds white coat.	Breeding takes place in early summer, such as June or July. 11 months after breeding, or in April-May, 1 pup is born. It is nearly 5 ft. long and has a coat of curly gray hair. Nursing period is rather long and mother has 4 nipples instead of the 2 common with other seals.	From Feb.-May pups are born. One pup, weighs about 30 lbs. Increases in weight 3-4 pounds a day for about 8 days, protected by both bulls and cows. Pup deserted in about 3 weeks and breeding takes place. Young sexually mature at 4 years. White coat is shed before birth and pup appears bluish-gray with new coat.
Food largely fish, which young can catch at 3 weeks of age. May also eat squids, crustaceans and other marine life, but about 95% is fish. Found in herds of more than 100. When coming ashore cows and young precede bulls. Speed 10 m.p.h. in water, 3 m.p.h. on land. May eat 10 lbs. of fish a day. Can dive to 240 ft. Can sleep under water 15 min.	Food largely fish, including whitefish and cod, and also crustaceans and other marine animals. Food collected at depths of 200 ft. May swim underwater for 20 minutes. Speed while swimming is 20 mph. Found in herds of to 500,000. Animals are gentle, affectionate and unsuspicious. Some authorities believe fish food only 50%.	From 6 weeks to 6 1/2 months young are dappled yellow. At 6 1/2 months 2nd coat is shed. Bulls unable to win females until about 5 years old. Spend winter in open sea. Bask and sleep on rocks in spring. Breed in September and October. October coat has longer hair on neck in bulls. Food solely fish.	Rather solitary in habits and groups are usually family groups. Food is largely mollusks gathered from the bottom, with beard probably useful as a sensitive exploratory agent. Animal is believed to harbor more than its share of intestinal parasites.	Bulls are generally quarrelsome. Can leap full length out of water. When angered inflates the hood, which in bull may measure 7 in. long by 6 in. wide. Hood in cow is smaller than that of bull. Food is probably almost exclusively fishes. Call is a loud bark given in excitement. Rather solitary animals.
Of little value for fur, hide or oil. Fur durability 25% that of other. Since herds are small it is not economically worth while to make great hunts. Flesh tastes "like assafoetida flavored with onions," according to some, but Esquimos like it. Break fishermen's nets. When swimming, surface at intervals of 5-6 minutes.	More than 100,000 are harvested annually, primarily for hides and oil. Fur of no value. Quite probable that value of oil and leather more than compensates for loss of fish eaten by the seals. Great expeditions make the harvest, which is profitable primarily because of habit of forming great herds.	Gregarious. Can dive to 240 feet and can exhaust 90% of air in lungs in dive. Can drop heart beat from 100 to 10 per min. and retain that speed 20 minutes. Oxygen consumption drops to 20% of that in repose. Relatively insensitive to increase of CO ₂ in blood. Gray seal of no great economic importance.	Fur of little value. Meat is eaten by natives. Liver is believed to be poisonous at times, and trichinosis may be caused by eating the meat. In part because of its great thickness the skin is of great value to natives, who make heavy lines of it for use on harpoons and for other gear such as dog harnesses.	May be considered enemy of fishes. Have been hunted and killed so relentlessly and so foolishly that their potential importance is relatively little. Might yield good leather and oil and some flesh, although this might not be universally popular for many reasons.

COMMON NAME SCIENTIFIC NAME	SEA ELEPHANT ELEPHANT SEAL <i>Mirounga angustirostris</i>	MANATEE, SEA COW <i>Trichechus latirostris</i>	SPERM WHALE <i>Physeter catodon</i>	NARWHAL <i>Monodon monoceros</i>
DESCRIPTION	Length, bull to 20 ft. more commonly 18; cow to 9 ft. Weight, bull to 6000 lbs. Height to 5 ft. Width to 4 ft. Girth to 20 ft. Pale brown to gray, and lighter beneath. Cow gray all over. No external ear. Flippers large. Eyes dark brown. Snout to 10 in. by 6 in., inflatable. Teeth I 2/1, C 1/1, P 4/4, M 1/1.	Length, to 15 ft. Weight, to 1310 lbs., but normally smaller than here described. No hind limbs or trace of them. Forelimbs encased, flat, flexible, flipper-like. Two mammae on breast close to armpits. Snout blunt, sensitive. Hair sparse, colorless. Dull lead gray. Eyes small. Ears inconspicuous. Body fish-like.	Length to 80 feet in males. Females may be half length of males. Greatest circumference between eyes and flippers. Tail flukes to 14 feet from tip to tip. Upper jaw toothless but lower with to 24 teeth to 8 inches long. Smooth. Black above to white beneath. One blowhole to left front. Blubber to 14 inches thick.	Length to 16 feet. With 1 to rarely 2 terminal tusks, usually a left, hollow, white, spirally twisted counterclockwise on male, although female may rarely develop a tusk. No external ears. Body 2 feet in diameter at shoulder. Head blunt. Mouth narrow. Eyes small. No dorsal fin. Black or gray, dark mottled or white.
RANGE AND RELATIONSHIP	Order Carnivora. Family Phocidae. Northern, from Baja California, Mexico to Marin County, California on offshore islands mostly; occasionally north to Prince of Wales Island, Alaska. Southern elephant seal is more or less confined to Campbell Island 300 miles south of New Zealand.	Order Sireniidae. Family Trichechidae. Florida manatee in shallow salt or brackish water from Florida around Gulf of Mexico and in West Indies. Others in South America and in Africa. Related Dugong is found in Pacific Australia, Indian Ocean and Red Sea. True sea cow, 25 ft. long, extinct for 200 years.	Order Cetacea. Family Physeteridae. Most abundant between 50° North and 50° South latitudes. Old males may appear at extremes of Arctic and Antarctic. Gregarious in "pods" formerly of to 1000. "Blows" obliquely forward 60-70 times in 10 minutes, followed by submergence of to 75 minutes. No dorsal fin.	Order Cetacea. Family Monodontidae. One species. White whale, <i>Delphinapterus</i> , with 2 species, shares family. Arctic seas. North of Cape Halkett in Alaska, 71°N., and from Atlantic coast of Labrador to northern Hudson Bay. Relatively common in migrations in Lancaster and Eclipse Sounds, Bylot Is.
REPRODUCTION	1 to 2 pups born Feb.-June, (in North.) Black at birth, to 2½ feet long. Gestation for 49 weeks. Nursed for 6 weeks. Young molts at 1 month. In breeding grounds bulls may maintain harem of to 150 by fighting off rival bulls, trumpeting defiance meanwhile. Pregnant cows develop gray mask in place of black.	1-2 young born in April or May, under water after about 152-day gestation period, weighing about 60 lbs. at birth. Mother immediately raises young above surface, carrying on back about 45 minutes, then over 2 hour period gradually submerges with it. Nurses 18 months. Young must be raised to air every 3-4 minutes 1st week.	Probably polygamous. 1-2 young, to 14 feet long, born 10-12 months after mating. May be 20 feet long when nursing ceases. Matures at 8 years. Life expectancy 20 years. May double length 1st year. Mother but not father protects young. Young nursed while mother swims on side. May commit mass suicide apparently.	Little known of reproductive story. Calves may be to 5 feet long at birth. Usually one, but twins have been recorded. Calves blue-gray and darker than adults, remain with mother for a long period. Tusk is not known to be used in capturing prey, but may well be used by males competing for a mate.
ECOLOGY	Feed at night and sleep by day. Food primarily squids and other cephalopods. May fast 2 months during breeding season. May go 700 yards from sea. Speed to 5 m.p.h. Can submerge for 12 minutes. On land can throw pebbles with surprising accuracy with flippers. While harem may be 150 cows, it is normally 12-20.	Can submerge as adult to 30 minutes and exhaust 90% of air in submergence while submerged. Has low sensitivity to CO ₂ in lungs. Heartbeat slows from 50 per min. in dive to 30 per min. Body temp. about 100°F. with water temp. at 78°F. Sense of touch excellent; of sight and smell poor. Food exclusively aquatic plants.	Food chiefly large cuttlefish and squids. One swallowed whole a 10-foot shark, and might well swallow a man whole. Irritated intestine may cause formation of ambergris, an opaque white wax, sometimes black, melts at 60°C., below boiling point of water. 400 lb. mass sold for \$100,000, used to hold perfume scent.	Food includes mackerel, herring, skate, salmon, haliibut, flounder, sea scorpion, shrimp, cuttlefish. Food swallowed whole. Usually gregarious, but groups usually made of one sex. May give whistle on emergence, or female may give deep roar or low-pitched blast in calling young. Worst enemies man and killer whales.
ECONOMY	Greatest enemy is man and killer whale. May return to breeding area twice a year; once to breed and once to molt. Have been hunted relentless for use in making oil and at one time for use in making dog food. Now have reasonable protection both in the North and in the South and should not become extinct.	Flesh excellent food. Breast meat light; pelvic region, red meat. May be fed loaf of bread a day in captivity. Hide is superior for valve leather. May ruin nets. Enemies alligators, killer whales, man. \$500 fine for killing one in Florida. Deserves complete protection. Teeth I 3/2, C 0/0, P and M 6-11/ 6-11.	60-foot whale may yield 4000 gals. of oil. 43-foot whale weighs 86,000 lbs. with 925-lb. liver, 277-lb. heart. Eats 1 ton food a day. Oil not suitable for use as human food. May descend to 3200 ft., where pressure is 1400 lbs. per sq. in. Spermaceti in head may serve as cushion against pressure. Female bears young every other year.	Esquimos eat flesh, burn fine quality oil and use intestines in making lines and clothing. May submerge to depth of 1200 feet. Horn source of mythical unicorn. Horn believed to have mystical ability to counteract poisons in drink. Ivory from tusk valuable. Mentioned in Bible in Psalms 92-10 as horn of unicorn.

BOTTLE-NOSED DOLPHIN <i>Tursiops truncatus</i>	KILLER WHALE <i>Grampus orca</i>	RISSE'S DOLPHIN <i>Grampus griseus</i>	PILOT WHALE, BLACKFISH CAA'ING WHALE GRINDHAL <i>Globicephala melana</i>	PORPOISE <i>Phocaena phocaena</i>
Length, to 12 feet, with well-defined, 3-inch snout. 20-22 teeth on each side of each jaw, to 3/8 in. in diameter. Lower jaw longer. Eyelid mobile. Prominent central dorsal. Black to gray or purplish above. Belly white. Flippers arise in darker areas and taper moderately to a point.	Length, male to 30 feet, with 6-ft. upright dorsal fin; female to 20 feet, with 2-ft. upright dorsal. Body stout and rounded. Flippers narrow and short. Eyes large and oval, with white patch to rear. Black above, white below, with yellow-purple patch under back fin on each side. Glossy.	Length, to 20 feet, but more commonly under 13. Mature male blue-white with dark brown patches; female uniform brown. Bulging forehead but no beak. Flippers moderately long and narrow, to 1/5 the total length. Dorsal fin moderately high and recurved. Mouth horizontal, profile turns upward to rear.	Length, 16-28 feet. Head swollen forward, bulging over upper jaw. Mouth curves up and backward towards eye. Back fin with long base, rounded tip and incurving rear outline. Flippers 1/5 the length, narrow. Black with white heart-shaped line under chin. Joints in 2nd finger, 11. Body cylindrical.	Length to 8 feet but rarely more than 6. Width to 2 1/2 ft. Weight to 120 lbs. Widest between flipper and back fin base. No ridges on flukes. Eye small, with yellow iris. Ear-opening a pin-point size. Plain dusky above; paler beneath. Skin smooth. Back fin triangular, low. Flippers, oval, blunt, small.
Order Cetacea. Family Delphinidae. Almost world-wide distribution. S. Africa, Brazil, Argentine, Indian Ocean, North Sea, Baltic Sea, Mediterranean, Bay of Biscay include this and closely related species. Common off Atlantic Coast of North America, usually in large schools just off breakwaters.	Order Cetacea. Family Delphinidae. Found over almost all oceans of the world, from Bering Sea and Greenland Sea in north to Ross Sea and Scotia Sea in the south, and even found up some rivers, where they may have pursued migrating fishes, and where they may rather frequently become grounded.	Order Cetacea. Family Delphinidae. Large coastal in abundance, but found from New Zealand to India and Japan and China Sea; from Cape of Good Hope to Massachusetts; in the Mediterranean, North and Baltic Seas and along California coast. Not uncommon along Atlantic Coast of North America.	Order Cetacea. Family Delphinidae. Genus is worldwide in distribution. <i>G. scammonii</i> typically North Pacific and <i>G. macrorhyncha</i> typically of South Seas are found off American coasts with this species. <i>G. scammonii</i> of North Pacific, <i>G. indica</i> of Indian Oceans, and <i>G. brachyptera</i> are all black.	Order Cetacea. Family Delphinidae. Coast lover. One of commonest seen in surf from shore. Found in North Pacific and North Atlantic and south to Rio de la Plata and in Mediterranean. May be common in harbors and river mouths in many parts of the world.
Courts by swimming upside down. Early season schools of mixed sexes; late schools of one sex. Young born 10 months after breeding, toothless, nursed about 15 minutes at 30 minute intervals, but can submerge at first for only 30 seconds. Nurse for 14 weeks. Beginning 11th week can eat 11 lbs. fish.	Apparently pair at the end of the year about the time the young are born. Usually about 12 months between mating and the birth of the young. Young may measure to 7 feet in length at birth, or at least shortly after. Little known of the breeding and growth habits, or of life expectancy.	Probably mates and breeds about the end of the year with young born about a year later. Little known of breeding habits. A female about 10 feet long was found bearing a full-grown young measuring more than 5 feet. Young may have rows of whitish bristles on upper lip, with 8 on each side.	Apparently pair in warm waters during northern winter months and bear young on return a year later. Off England an April female had 3-unborn young. Many September females had full time or newly born young. Young 5-6 feet long at birth and apparently are suckled for several months. Young may be 1/2 length of mother.	Pairs in late summer. Young, to 34 inches long, is born singly about 11 months later. Mother suckles young by swimming on her side permitting calf to breathe as it feeds. Life span reported to be 30 years but is short in captivity. Relatively little known about life history.
Food is fish. One reported to have eaten a 4-foot shark head first, but this killed the eater. Sleeps afloat. Can see well 50 ft. through air, but can hear fish hit water farther. Schools possibly kept together by sound but can whistle. Can swim at 30 knots and can leap 2 times length out of water.	Commonly found hunting in packs of 5-40, preying on fishes, sharks and large whales, seals and walruses. Largest whale can be killed by 3 or 4 working together. Mouth is 18 inches wide, with each side of each jaw with 11 to 14 long, narrow, strong, slightly recurved teeth which interlock with those of other jaw.	Food believed to be wholly cuttlefish. May have 2-7 teeth on each side of each jaw, but mature and old animals may have none on upper jaw. Teeth on lower jaw are usually more than 1/2 inch in diameter and exposed for at least 3/4 inch, and are borne forward on lower jaw for about 1/5 length of jaw.	Food largely cuttlefish and similar relatively small marine animals. May give off spout to 5-feet high, and appear in schools of 5-40 animals, which may bellow loudly when beached. Apparently may beach themselves voluntarily, resulting in their death. Follow leader to own destruction.	Food largely fish, including herring, whiting, sole, salmon, eels and crustacea and cuttlefish. Mouth is round. Teeth spade-shaped, with 23 to 27 on each side of each jaw, with greatest diameter of about 1/10 inch at the gums. Found in schools of 50 to 100, swimming in circular leaps. Active before squalls.
At one time supported a commercial fishery off Cape Hatteras, where more than 1200 were taken from Nov., 1884, to following May. Hunted widely for oil over the earth. Heart-beat while breathing at surface is 110 per minute, but when submerged it drops to 50 per minute.	Great enemies of whales and seals that are of economic importance. In attacking whales usually tear lips and tongue first. Can outswim the fastest dolphins. One 21-foot killer whale had remains of 14 seals and 13 porpoises in its stomach. May jolt seals off ice flows, according to some.	Usually more or less solitary, or found in schools of less than a dozen. Most famous was Pelorus Jack that for 32 years escorted ships coming into Pelorus Sound in New Zealand and over a 5-mile stretch. For 10 years this animal, which disappeared in 1912, was protected by an act of the New Zealand legislature.	Fishermen drive blackfish on beaches by united groups of boats. Each blackfish yields to 40 gals. of blubber oil and to 2 1/2 gals. of head and jaw oil. Meat is pickled or dried, and stomachs are used in making buoys. "Caa'ing" refers to habit of being driven in panic or otherwise.	Flesh is sold as meat, and oil has been used in lamps. Flesh looks like pork but has disagreeable flavor. In the Middle Ages it was a favorite food during Lent, probably being considered as a fish rather than as a mammal. Was a royal dish in time of Henry VIII. May destroy useful fish and nets.

COMMON NAME SCIENTIFIC NAME	FINBACK WHALE <i>Balaenoptera physalis</i>	BLUE WHALE, RORQUAL <i>Balaenoptera musculus</i>	HUMBACKED WHALE <i>Megaptera novaeangliae</i>	RIGHT WHALE <i>Eubalaena glacialis</i>
DESCRIPTION	Length, to 82 feet. 70 ft. animal weighs 131,000 lbs., skeleton 18,500 lbs. whalebone 1000 lbs., lung 2700 lbs., heart 840 lbs. Head triangular profile from above. Head under $\frac{1}{4}$ length. Female longer than male. Flippers $\frac{1}{9}$ total length. Throat fluted. Ridged towards tail. Gray above to pale brown beneath, sides differing.	Length, to 109 feet. Largest animal that ever lived. 90 ft. whale had 45 ft. circumference weighed 150 tons, with 3 ton tongue. Female the larger. Head not narrowed forward. Flippers $\frac{1}{7}$ total length. Throat with 80-100 grooves. Dorsal fin low and small. Bluish. Back and sides color of corrugated iron.	Length, to 75 feet; average 40 feet. Beak short. Dorsal fin obsolete. Lower jaw longer than upper. Flutings of throat from chin to navel, 18-26 with 5-8 inch grooves between. Body short, thick, with lumps and protuberances and many barnacles. Black above. White or whitish beneath body and flippers.	Length, to 70 feet, but 60 more common. No back fin. No throat grooves. External ear a pinpoint size. Lower jaw arched upward. No white at tip of lower jaw. Head about $\frac{1}{4}$ total length. With "bonnet" of horny material like a corn heavily infested with parasites. Black but 20% with whitish belly.
RANGE AND RELATIONSHIP	Order Cetacea. Family Balaenopteridae. Found in all large oceans originally. Relatives include blue whale, <i>B. musculus</i> , Sei whale or Rudolph's rorqual, <i>B. borealis</i> , and little piked whale, <i>B. acutirostrata</i> . More abundant in Atlantic than blue whale. Migrates annually.	Order Cetacea. Family Balaenopteridae. Winters near Equator. Now mostly Antarctic, but has been taken in Iceland, Alaska, Japan, California, South Africa waters. Migrates annually north and south. In 1935 produced nearly 945 of total whale supply of the world.	Order Cetacea. Family Balaenopteridae. In Pacific from Bering Sea to Panama. In Atlantic from north of Iceland to Bermuda and Trinidad. Usually spends winters in tropical waters, being rather regular in their movements over long periods of time.	Order Cetacea. Family Balaenidae. <i>E. glacialis</i> , North Atlantic. <i>E. sibboldii</i> , North Pacific. <i>E. australis</i> , Antarctic. Related to bowhead or Greenland right whale, <i>Balaena mysticetus</i> , whose lower jaw bows upward, has white chin, black whalebone, few parasites, head more than $\frac{1}{3}$ length, lives close to ice.
REPRODUCTION	Mates in warmer seas in winter. One year later one or 2 young to 22 feet long born. Nursed for 6 months. Males mature in 3 years at 64 feet; females in 3 years at 66 feet. Full grown at 8. Prime of life at 10 years and old at 20 years. May mate over a 7-8 month period, with height in Antarctic May to August.	Probably monogamous, mating under water June-July. Young born a year later, with young every other year. Calf 25 feet long at birth, weighs 4 tons, nurses 7 months reaching 50 feet length. At 1 year, female to 56 feet. Sexually mature at 3 years and 77 feet length. Full grown at 10-14 years. Life span more than 50 years.	Winter months are calving time. Most young in Northern Hemisphere born about March, or less than a year after mating. One young from 15-16½ feet long and weighing from 3000 to 4000 lbs. At end of year suckling is 25 feet long, and at end of 2nd year 41 feet. Under parts of young black, of adults white. Life span 20 years.	Probably mates in July in Arctic and young born possibly in February. Calf to 15 feet long, nursed 6-12 months, cared for by most affectionate mother. Possibly right whale nurses shorter period than the bowhead. Rarely there may be twins. In bowhead calves are blue-gray; young, blue-black.
ECOLOGY	Gregarious, in schools of to 300. Speediest of whales, moving at to 30 m.p.h. May leap clear of water, dive 4 times at 15 sec. intervals and submerge for 30 minutes if undisturbed. Feeds on small fishes and crustaceans, "krill." Favors adult crustaceans while blue whale favors young. Can dive to 1150 ft.	Food almost exclusive shrimp-like "krill" of young crustaceans strained from sea through whalebone in mouth. Stomach holds about 1 ton of food. Speed 12-14 knots. One towed vessel with engines reversed at 8 knots for 7 hours. May make shallow dives at 15 second intervals. Deep dive may last 49 minutes.	Food "krill" strained through whalebone and also small fishes. Known to swallow cormorants. May leap straight up into air falling on side. Spout from 2 blowholes forms one short broad jet. May dive almost vertically and remain under 20 minutes. May be found singly or in small schools.	Food largely "krill" or small crustaceans strained from water through whalebone, which, in right whale, is blackish and to 9 feet long, and in bowhead is black and to 14 feet long, in to 250 plates in right whale and to 360 plates in bowhead. Spouts forward in 2 streams making a huge V. Bowhead may submerge 80 min.
ECONOMY	May spout 7-12 times in succession to height of 20 feet, with vapor rising vertically and expanding into long ellipse. Whalebone of economic importance is slate-colored, marked with brown, to 3 feet long, with some yellow and slate-colored, to 4 feet long; in 370 plates. Killed for oil and whalebone.	One taken in 1948 yielded 133 bbls. oil and 6 metric tons of red meat worth \$28,000. Whalebone is black not slate-colored as in finback, and is in about 400 plates. Sulphur bottom due to diatoms on under side of whale. Spouts vapor to 30 feet high. Has a "beard" of 20 to 40 hairs. Renew 90% of air in lungs on emergence.	A good oil-producer. Sinks at death. A 45-foot animal may weigh 9000 lbs. and yield 425 lbs. of black 2-foot whalebone. Oil not of best quality but in good quantity for size of animal. One blue whale should yield 2 times that of finback and 2½ times that of a hump-backed whale. Whalebone in about 400 plates.	Formerly one of the commonest whales, now among the rarer due to slow speed, ease of capture and other things. Through international control these whales are recovering slowly but greatest boon would be reduction of economic importance by development of substitutes for valuable parts. This is possible.

Latest Olympic Attack

An Editorial

WE HAVE in hand a "Memorandum of Facts re the Olympic National Park" prepared by Roderic Olzendam and Associates, counselors in industrial and public relations, of Tacoma, Washington. According to this eleven-page memorandum, this firm was retained by unidentified "people in Pacific, Grays Harbor, Thurston, Clallum, Jefferson, Mason, King, Pierce, Snohomish and Whatcom counties" to make a thorough study of Olympic National Park, "and to devise and carry on a Public Information Program leading to positive action by the Congress in 1957."

After a careful reading of this curious document we are in some doubt that it should be dignified by being considered a "threat" to the Olympic National Park as now constituted. Nevertheless, any public information program aimed at carving up the Park should at least be noted, even one as ill-informed and ridiculous as the campaign presaged above.

Olzendam and Associates propose a resolution for adoption by Congress in January, 1957. This proposes that "approximately one third of the heavily timbered, highly productive area situated on the lower fringes of the Olympic National Park in the State of Washington, presently under the control and management of the National Park Service, be transferred to the control and management of the United States Forest Service with the exception of the Rain Forest Corridors of the Hoh, Queets, and Quinalt Rivers, the area adjacent to Crescent Lake and the recently added ocean strip. . ." The resolution further provides that the Secretary of the Interior and the Secretary of Agriculture should get together and "reset and agree on new and proper boundaries in a scientific manner in order to bring about the highest recreational and economic returns from this area."

According to the proposal, some 300,000 unidentified acres would be thus transferred out of the 908,000 acres that this firm credits to the Park. (The actual acreage of Federal and non-Federal land now included is 896,599 acres, and the authorized size by Congressional Act of June 29, 1938, is 898,292 acres.) However, Olzendam and Associates would not wish to quibble about a few thousand acres, or about the fact that boundary adjustments would have to be made with great specificity by the Congress.

The memorandum of facts repeats the usual "facts" about ripe and over-ripe timber within the Park boundaries, and how much better it would be from the recreational and economic viewpoints if it could be cut. The memorandum concedes that all the people of the United States own the National Park, but that they also own the National Forests, so no change of ownership is sug-

gested—just a transfer of management.

Indeed the memorandum admits that: "Within the boundaries of the Olympic National Park grow the famous rain forests bearded with moss and beautiful to see. Deer, elk, bear and mountain lions roam these forests unhunted for hunting is forbidden under Park Service regulations. Trout leap in the lakes and streams and one may fish. The scenery in the High Country is magnificent. Glaciers gleam, snow-clad mountains glitter, wild flowers bloom in acres of profusion, and alpine lakes sparkle in the noon-day sun."

So, say Olzendam and Associates, let us take 300,000 acres out of this incomparable wilderness and open it to lumbering, hunting, and the construction of roads, and make it into a recreational paradise. What happens to such country when it is lumbered is graphically shown in the devastation wrought on acreage cut by Rayonier Corporation on lands immediately adjacent to the Park land.

The memorandum describes the establishment of the Park as a "steal." It was, it says, created by "high-pressure, un-American methods" and by dictatorship in the Department of the Interior. Olzendam and Associates subscribe to the absurd statement that "hundreds of acres owned by pioneers and settlers were condemned by the Federal Government and taken away without remuneration of any sort by the Government in the majority of instances." And to this one they add: "The Queets Corridor of 47,000 acres was purchased with WPA funds set aside to produce jobs for unemployed people." (This acreage was purchased with PWA funds, which is a combination of initials of quite a different significance.)

Then Olzendam and Associates come up with a final amazing proposal. They reckon that the Forest Service would receive \$2,000,000 a year from timber leases. The public relations firm whacks this up by directly transferring \$500,000 annually to the Olympic National Park for administration and improvement and letting the Forest Service pocket \$200,000 a year for construction and maintenance of roads. If the Treasury Department hears about this it is going to be very mad, because the law says the Treasury gets it all, except the legal allowance to the counties for schools and highways.

These and other absurdities in the memorandum might be amusing were it not for the fact that they may be accepted by some as truths. And, of course, the abysmal ignorance of the deeper significance of the Olympic National Park as Park is sad to observe. However, we do not believe that this latest outburst against this great area will get far, but it should be noted that it exists.



PHOTOGRAPH BY WINSTON E. BANKO, U.S. FISH AND WILDLIFE SERVICE

Two trumpeters wing their way over the Red Rock Lakes National Wildlife Refuge in Montana. Figures in the 1955 census of the swans show a decline of 52 birds from the 1954 high of 642.

Henry's Fork of the Snake River in Idaho provides

A Trumpeter Winter Resort

By KEITH BARRETTE

WHEN the swallows return to Capistrano, it is spring. When the rare and stately trumpeter swans wing into Island Park in southeastern Idaho, it is, by man's measure, time to button up the overcoat, for winter is not far behind. But to the trumpeters, that country offers them an extended spring. It also presents both a boon and a bogey.

During the first raw, blustery, gray days of November, the swans begin following the flyways across the Continental Divide, or through Red Rock Pass. The points of departure are either the Red Rock Lakes Migratory Waterfowl Refuge near Monida, Montana, or Yellowstone Park. But their destination is the same—the warm, open waters of Henry's Fork of the Snake River in Idaho. This is the winter resort for the largest flock of wintering swans in the United States.

Preheated by thermal springs to temperatures that may reach a high of 52 degrees F., Henry's Fork remains fluid and friendly, even during severe and sub-zero winters.

Actually only three miles of "the Fork" are designated as sanctuary. This is the Railroad Ranch Waterfowl Refuge, established in 1942 by the Idaho Fish and Game Department on property owned by Averill Harri-man. The swans, however, wander up and down the river, and to adjacent lakes and streams. Originally

the refuge was created as a resting area for geese, so that continued hunting pressure would not force them out of the country. Ironically, nothing was said originally about the swans. The protection afforded these birds had been somewhat incidental, and the value of the refuge to them was not realized at the time of its creation.

As the number of swans increased, it became more apparent that Henry's Fork and the Railroad Ranch Waterfowl Refuge are vital wintering grounds in this country for the trumpeter. And the Idaho Department imposed its "white bird regulation," which bans hunting of any white waterfowl in the four surrounding counties.

Winston E. Banko, manager of the U. S. Fish and Wildlife Service's Red Rock Refuge, says Henry's Fork has been utilized extensively by the wintering trumpeters since 1938, by actual record. However, there are indications that these magnificent birds have been using it for a time longer than is written on the records.

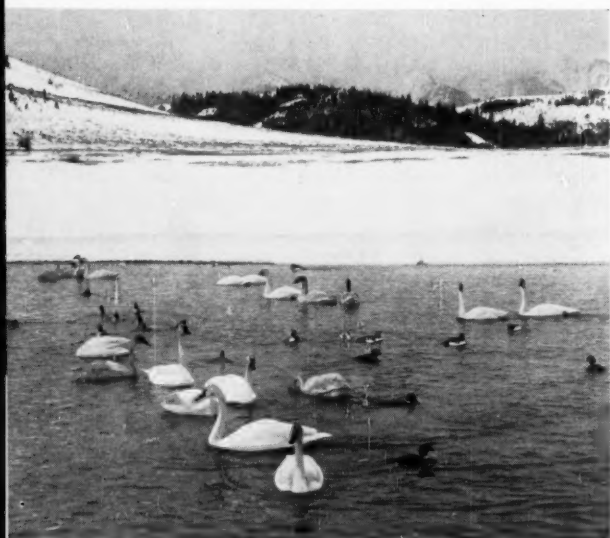
Another reason why this strip of geography is so essential to swans is because the river's shallow bottom abounds with pond-weeds, sedges and tule, major items in the diet of the adult birds. The mature birds are strictly vegetarian, but the young prefer meals with a higher protein content. The cygnets, during the first

→
Henry's Fork of the Snake River in Idaho is kept open by the heat of thermal springs, and many trumpeter swans commute there to feed and use the spot as a winter resort.

PHOTOGRAPH BY THE AUTHOR

Goldeneye ducks feed with the trumpeters on the grain supplied at Culver Pond in Red Rock Lakes National Wildlife Refuge

PHOTOGRAPH BY WINSTON E. BANKO
U.S. FISH AND WILDLIFE SERVICE



few weeks of life, enjoy a diet consisting principally of freshwater shrimps, water beetles and small crustaceans. As they grow older, water vegetation becomes increasingly important.

The winter population of swans on Henry's Fork varies from week to week, some birds commuting to and from Red Rock Lakes Refuge, where grain is fed during the winter. Some trumpeters prefer to remain "at home" during the mid-winter period, for these snow-white birds of the flyways are a hardy lot. This fact is probably a major factor in their vigorous response to protection, after the swans had been nearly blown to extinction by the down and skin hunters of the last part of the nineteenth century.

The majestic trumpeters, however, are still in need of the protection afforded them by law since 1924. While Henry's Fork provides them with needed sanctuary and food, it is also a booby trap for some. Almost every hunting season several swans fall victim to trigger-happy incompetents with shotguns. No doubt part of this is indiscriminate shooting, and some is malicious destruction. This may account in part for the decline

in the number of United States' swans, in 1955, from the 642 birds of 1954 to 590 shown in the recent census.

Just why anyone would want willfully to destroy one of these great birds is difficult to imagine. As game birds they are completely worthless, but as an esthetic part of our natural heritage, the trumpeter swan is priceless.

To call hunters incompetents, in this day of high-pressure hunting propaganda, is to court being classed as a "crackpot." But any hunter, who cannot distinguish a swan from a goose, or one who wantonly destroys, is certainly too immature and irresponsible to be trusted with an instrument as lethal as a gun.

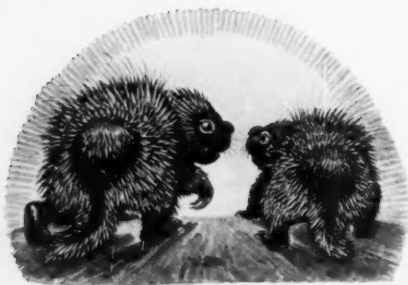
Threats of fines and incarceration do not seem to deter these vandals. The Island Park trumpeters have the best of law enforcement. With the approach of each waterfowl season, Federal and Idaho conservation officers keep anxious eyes and constant vigil on Henry's Fork. Not until the hunting season ends and winter begins to wane do these keepers of our wildlife breathe easier, but they are admittedly alarmed over this needless drain on the still low population of America's trumpeters.

What is the answer? The present boundaries of the Railroad Ranch Waterfowl Refuge could be expanded to embrace a much longer and wider area of Island Park. This is necessary because of the wandering habit of the swans. It would not be unreasonable to close Henry's Fork to waterfowl shooting from its source in Henry's Lake to its mouth. There are ample places for hunters, but only one Henry's Fork for the trumpeters.

There is more to the Henry's Fork story, also. It provides a sidelight on the history of the trumpeter swan; it emphasizes the change in the habits of these birds. They have transformed from a more widely migratory species to being commuters, and from birds once familiar to a large part of the United States to strictly inhabitants of the West.

Henry's Fork also emphasizes the fact that while the trumpeter swan has been rescued from extinction, this is not necessarily permanent. Theirs is still a precarious existence, as the 1955 decline indicates, and care and vigilance are still vital.





The Love Call of the Porcupine

By OTIS H. GREEN

WHO HAS heard the love call of *Erethizon dorsatum*? I have, and it took me forty years to accomplish it. I had considered myself an old porcupine hand. It must have been about the year 1915 that I was first kept awake all night—or so it seemed—by the perverse gnawing of one of these creatures on the under side of the planking beneath my bed of balsam branches, in a spruce-log leanto on Copperas Pond. Since then they have often disturbed my slumber. One British Columbia specimen grievously chewed my combat boots, spitting out the eyelets—I had thought them omnivorous!—and leaving me quite inadequately shod for my last ten days in the grizzly country. And lo and behold, here, on September 1, 1955, was something new under the moon!

I was living alone in a log cabin on a private lake in the Ausable Valley in the Adirondacks. There were two other camps on the lake, but for almost the entire summer I had been the only inhabitant of those woods. Deer shared my bathtub and my berrypatch. Beavers fed on the lily stems at dusk and slapped their trowel tails in the darkness. Foxes and raccoons, wild ducks and herons and bitterns, owls and ospreys were fellow-dwellers in my sanctuary. And now it was September. On the hillsides and along the shores the first red splashes showed where a maple was greeting the new season.

At seven I had gone by trail to the middle beaver dam, which, with a gentle sound of falling water, divides my lake into two sections. I had been rewarded by a palely glowing sunset and a flight of six mallards. The beavers would be out later to leave their watery trails through the spatterdocks. As the light dimmed, I went back to the cabin, put on an extra wool shirt, took the paddle and went out to enjoy the witchery of the evening from the center of the great mirror.

Thirty minutes of pure contemplation; and then adventure came in on the soundwaves. What an utterly unreasonable caterwauling!—an extremely loud miaowing that compelled instant and startled attention across two hundred yards of space. Wildcats? I doubted it. It was not yet dark, and the sounds did not seem authentic. I could not even be sure that the throat, or throats, emitting those sounds were mammalian. Great blue herons, perhaps? Was there a rookery I had missed, high up there on the bank? Certain throaty, almost childlike undertones suggested porcupines. It seemed useless to try to investigate. My crashing through the alders beyond the marsh would certainly rout the quarry.

The caterwauling continued, however, and remarkably

loud. I simply had to make the attempt. Beaching the canoe, I walked through the waist-high grass, entered the alders and crawled, to avoid their interlocking branches, up the bank and into the timber—too noisily, alas! The catcalls ceased.

I had been right in suspecting porcupines. High in a tall, large-toothed aspen I could see their dark forms—hunched bodies and supporting tails—against the still luminous sky. They froze, and so did I, for a long, long half-hour. Only the faintest grumbling whimpers and some chattering of teeth—at this close range unmistakably hystericine—were audible at the end of that time; then renewed silence. I grew weary. The moon had come up in the meantime and my creatures were scarcely distinguishable from bunches of massed foliage.

That it was a case of courtship I had no doubt. Could a mere human being set true love in motion again? On the assumption that the presence of a presumptive rival might stir the wooer to activity, I essayed some porcupine love calls myself.

My results were poor, much poorer than my conversations with owls or white-throated sparrows. But perhaps not all porcupine lovers are good songsters. No matter. A stratagem is good if it works. My dark forms came to life again and so did the surrounding air.

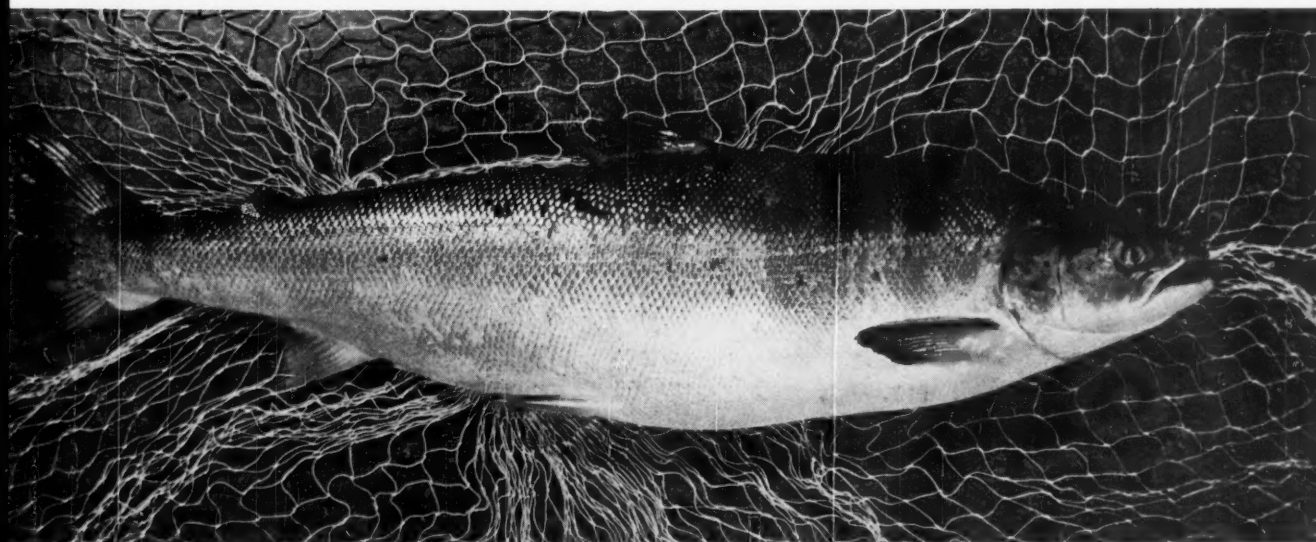
The courtship, as long as I was a witness to it, remained in the preliminary vocal stage, like the first ecstatic birdsongs in April. Actual mating occurs late in September. All of the noises came from the individual that crouched higher in the tree, and it I judge to have been the female indulging her porcupine right to squall loudly at the desired approach of her partner. Only once did she make the slightest movement downward, and then her suitor retreated, moving out, eventually, to a lateral branch. Yet there was no silencing of the protests, which continued loud and long, while I watched the moon climb higher.

My sense of empathy began to dwindle. Stirring the bushes again, I pushed my way through the tangled alders and the fallen balsams, stumbled over the bothersome grassclumps of the swamp through the already condensing dew, found the dark form of my canoe, launched it and paddled to my half-seen and half-sensed landing. It was a quarter to nine. I lit the lamp, built up the fire, enjoyed a hot cup of thick malted milk and turned in, while Nature continued to conduct—in silence now, except for the hooting of a far barred owl—her symphony of life, death and courtship, night and dawn.

Man is applying research and action to achieve

The Atlantic Salmon's Comeback

By ANTHONY NETBOY



PHOTOGRAPH BY IRVING DOOH

The history of the Atlantic salmon can probably be traced back farther than any fish known to modern man. It was a morsel relished by the cave man.

IN THE family of food and game fishes, the Atlantic salmon, *Salmo salar*, has a high and venerable position. Once it inhabited all the suitable outflowing streams from Iceland and Greenland through the Scandinavian countries and even the tidal rivers of Germany, France and northern Spain. In North America salmon ranged from Hudson Bay to Cape Cod. Salmon migrated up the St. Lawrence and other rivers as far as the Great Lakes. New England streams once teemed with this delicious fish and so did the Housatonic and Hudson.

The commercial and sports salmon fishery is now almost entirely confined to Canadian waters, and even here the runs have declined in the past twenty-five years.

The history of *Salmo salar* may be traced farther back, probably, than that of any other fish now known to us, for it was a morsel relished by the cave man. Not many years ago archaeologists unearthed in the Pyrenees district of southern France a piece of reindeer bone carved with the picture of a salmon! In the first century A.D., Pliny the Elder wrote in his curious *Natural History*, "In Aquitania the river salmon surpasseth all the fishes of the sea."

Gluttonous Roman patricians highly prized the red meat of the salmon, which they imported from their British and Gallic provinces. The Anglo-Saxons were

certainly familiar with this fish since they gave it the names which now identify the species in its various stages, such as *parr*, *smolt*, and *grilse*. The Normans introduced into England the Latin name, *Salmo*, applicable to the adult fish, which graced the banquets of the lords of the manor. This became salmon.

Atlantic salmon, like Pacific salmon, were a common food of the American Indians, who caught them with wooden spears and torches. When John Cabot discovered Newfoundland in 1547, he found salmon plentiful in its rivers. The fish was a dietary staple in Colonial days. Indentures of apprentices attest to the fact that, while prizing its succulent meat, they refused to be fed salmon more than two days a week. Even as late as the early 19th century New England fish markets were glutted with salmon, and often the housewife who went to buy shad also had to take salmon as a tie-in sale.

There are five well-defined stages in the life of *Salmo salar*. The eggs hatch in cold, gravelly streams, generally the main stem or tributaries of an estuarial river. First comes the alevin or fry, which feeds on its large yolk sac for a month or two. Emerging from the gravel, the fry feeds on small insect life and soon is transformed into the little parr, with its red and black spots, dark vertical bands, and sharply forked tail indicating it is

a member of the trout family. The parr is well adjusted to the dulcet, bubbly stream where it lives for a year or two, reaching five to ten inches, and feeding on the abundant aquatic life.

In the second or third spring, as the parr begins its migration to the sea, it discards its red spots and vertical marks, and assumes the true silvery color of the salmon. Now it is known as a smolt, and retains only black spots and a forked tail as chief indications of its identification.

The smolts generally enter the sea during the month of May. Here they feed voraciously and grow rapidly. After their first winter in the ocean, when they are called "grilse," they may weigh several pounds, and towards the end of the second summer ten pounds or more. (The average size of a mature fish is about fifteen pounds, although thirty- and forty-pounders are not uncommon, and salmon weighing up to eighty pounds and more have been taken.)

Grilse may return to their home stream—as the Pacific salmon do—to spawn. Most fishes, however, do not spawn as grilse but spend two years in the sea before returning to spawn as adults. Unlike the Pacific salmon, which die after the terrible ordeal of spawning, many of the Atlantic salmon find their way again to the sea. A salmon just after spawning is known as a "kelts;" anglers sometimes refer to them as "blacks." Few salmon probably live more than ten years, or spawn more than three or four times, always making the journey to the parent stream.

Because of the varying life cycles of *Salmo salar*, a given run of fish may contain three categories: (1) grilse that have spent one year in the ocean; (2) mature fishes that have spent two or three years in the sea and are returning to spawn for the first time (most of the run will consist of such fishes); and (3) mature fishes that spawned before and are returning as "repeaters." Exceptionally large fishes may be those that have remained an extra season or two in the ocean or have spawned and survived to spawn again.

In fresh water the young salmon feed largely on stream insects. In the sea, little is known about their food habits but an abundance of marine life, such as crustaceans and small fishes, is available to them.

Salmon returning to fresh water to spawn do not feed but take their nourishment from the layers of fat stored up in the ocean. Driven by an uncanny urge to

reach their natal waters, they will surmount huge obstacles such as six-foot waterfalls. Anglers endeavoring to hook the salmon generally encounter a fish that has few peers for acrobatics.

Man has dealt the Atlantic salmon heavy blows by building dams and log ponds, dumping logging mill wastes and sewage into the rivers, and deforesting the watersheds. Steadily the Atlantic salmon's range has been constricted. The commercial catch in the United

States has been reduced to about 1500 pounds annually and the sports fishery until recent years was negligible. Connecticut, Massachusetts and New Hampshire no longer harbor any salmon, and only remnants of its once famous runs are found in Maine.

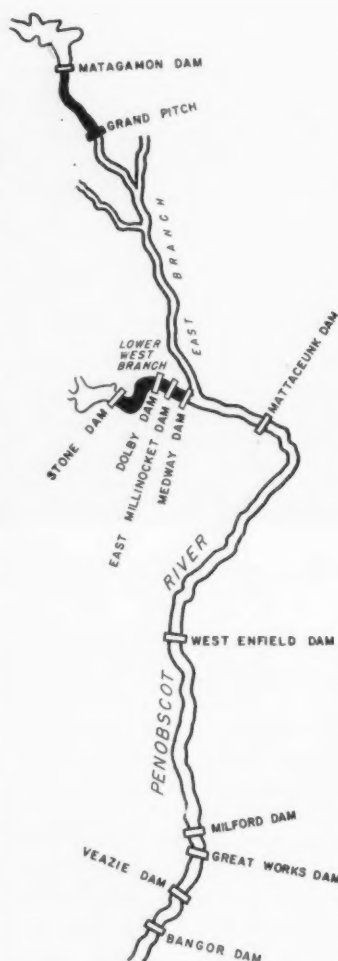
We know that at least three-score Maine rivers—and perhaps more—once possessed the proper environment for rearing salmon. These had sufficient flow to permit the adults to ascend the deep, cool pools, and reach the gravel beds to lay their eggs, and waters rich with insect life to support the parr. A survey of Maine salmon streams in 1949 by the Atlantic Sea-Run Commission revealed that most of them had been ruined by settlement, industrialization or deforestation.

On the Penobscot, once famous for its log drives and lumber mills, salmon had to brave the gauntlet of four dams to the first spawning grounds, six to the better locations. Two tributaries, the West Branch and Piscataquis, were entirely closed by dams built without fishways. The Androscoggin was excessively polluted, while the Aroostook needed additional fishways. The Presumpscot had too many dams; moreover, about fifty second-feet of water had been diverted for domestic use, so there was not enough to maintain a fishery.

On the Machias and East Machias the fishways required improvement; the Narraguagus was blocked by Beddington dam; the Pemaquid had a good flow but low gradient; the Ducktrap lacked water storage for summer flows. And so it went.

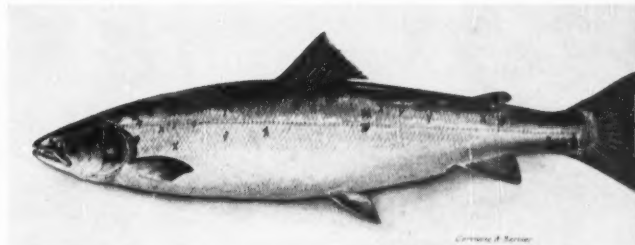
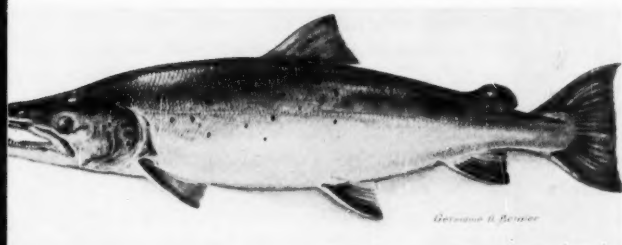
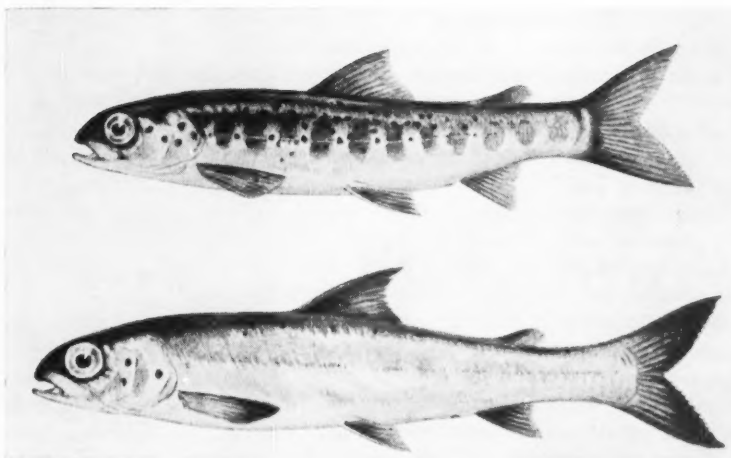
Despite these impediments and drawbacks, however, the Commission found that ten rivers had excellent potentials for salmon restoration; seven very good possibilities; and six good opportunities.

In the past five or six years the State of Maine, in cooperation with local industries and communities, has done considerable work to restore the salmon runs in some of the rivers, chiefly by elimination of pollution



Man-made barriers in Maine's Penobscot River indicate the difficulties facing the migratory salmon.

At the right is the salmon parr, looking much like a young trout. Below the parr is the smolt stage of the salmon, which means that the fish is now ready for the sea. Below, left, is a male salmon, which, with the approach of the spawning season, has developed a long head and hooked lower jaws. Below, right, is a female salmon, sleek and beautiful, caught in salt water. These illustrations from "Canada's Atlantic Salmon" published by the Department of Fisheries of Canada, Ottawa.



and obstructions. For example, about 100,000 fingerlings, incubated and reared at the St. John, N. B., hatchery, were released in the upper St. Croix River in 1949. A year later many of them were taken as parr and moved to Wapsaconhagen Brook below the dam at Woodland. This was proof that the river could still support salmon, although pollution from wood wastes continued to be a handicap.

Beddington dam was removed in 1951 and the Naraguagus River was restocked. The first returns from this experiment are expected in 1956.

Salmon returned to the Sheepscot River last year for the first time in the 20th century, and a spawning migration of 544 adult fish entered the Machias River. Restoration of other streams is in progress.

These results are encouraging to the Atlantic Sea-Run Salmon Commission which directs the work. Dr. W. H. Everhart, chief of fishery research and management, says, "We are very enthusiastic about the salmon restoration program. . . We are experiencing improvement in our Maine rivers and believe that our present watershed management reports will do much to remove the man-made obstacles."

The obstacles, however, are still numerous and much remains to be done. A March, 1955, report on the Penobscot recommends, for example, better maintenance of all fishways from Bangor dam to Mattaceunk; construction of a fish ladder at Milford dam; and maintenance of minimum flow at Matagamom dam on the East Branch, which the Commission is ready to restock with fingerlings. In contrast, the Lower West Branch is so

obstructed with dams that fish restoration is impractical.

Other rivers remain blocked. On the lower St. Croix three power dams, one belonging to a textile mill and the others to pulp and paper companies, are serious obstructions to anadromous fish. Fishways have been proposed for each dam to get the adults upstream and pollution control has been recommended. Restocking the streams awaits completion of fishways and cleaning up of the waters.

On the Aroostook, dams without fishways and polluted water hampered any attempts to breed salmon. In recent years the Atlantic Salmon Commission restocked the stream as conditions appeared suitable for return of spawners. Like the St. Croix, the Aroostook offers hope for the angler.

Working closely with the Atlantic Salmon Commission, the U. S. Fish and Wildlife Service maintains the only Atlantic salmon hatchery in this country at East Orland, Maine. Fish raised here are planted in the Maine rivers. Recent expansion and remodeling makes this hatchery one of the most modern and efficient on the continent.

In Canada salmon fishing is still a sizeable industry. Although civilization has not so pervasively encroached on the habitat, as in New England, the Canadian salmon fishery has witnessed a sharp decline in abundance.

Around the Gulf of St. Lawrence, Bay of Fundy, and waters of Nova Scotia, Cape Breton Island, Quebec and Newfoundland, the fishing fleets and their long drift nets congregate in summer. Sportsmen ply the cool and protected tidal rivers, many of which have achieved

international renown, such as the Margaree and St. Mary's in Nova Scotia, the Miramichi and Restigouche (home of the exclusive Restigouche Salmon Club) in New Brunswick, the Bonaventure and Matane in Quebec, and the Humber and Terra Nova in Newfoundland.

The commercial catch in the maritime region reached an all-time peak of 6,700,000 pounds in 1873, then declined steadily to about 2,000,000 pounds in 1900. A persistent upturn followed in the next three decades. 5,400,000 pounds were taken in 1930. But since 1930 the catches have been much lower with much the same kind and quantity of gear. Recent catches in the Maritime Province have been in the neighborhood of 1,500,000 pounds annually.

About half the catch is taken from the maritime region and the remainder from Newfoundland and Quebec.

Under the conditions existing during the past few decades, the industry had become discouraged. As C. J. Kerswill of the Fisheries Research Board of Canada has said, fisherman were "trying to decide if it is worthwhile to replace their worn nets before another year, or if they should go out of business."

The history of the salmon fishery in Canada resembles, to a large extent, that of the Columbia River salmon fishery in the United States. Only in relatively recent years did local and federal governments wake up to the realistic possibilities of arresting the tide of depletion. Since the commercial fishery offers employment to hundreds of people in Canada, while the sports fishery is an additional source of income to those who cater to anglers, there is urgent need to save the fishery.

A Provincial-Federal Coordinating Committee was formed in 1949 and brought about modification and expansion of salmon research under the Fisheries Research Board of Canada. One phase of the new program was undertaken by the Province of Quebec, while the Dominion Department of Fisheries increased the emphasis on better salmon management.

The principal objective is to rebuild the runs on every river where production has fallen off. This can be done only by restoring, as far as possible, the habitat in which the fish will thrive. Ideally, the river must be clean and unpolluted, with a steady flow of water, its nursery areas sufficient to meet the needs of spawners. Predators must be kept to a minimum—the trout who eat eggs and fingerlings, and mergansers, kingfishers and other animals who feed upon the parr and smolts. Barriers, such as dams or waterfalls, must be dynamited or equipped with ladders; poachers who take fish out of season or in forbidden areas apprehended; and fishing better regulated to provide an adequate escapement.

The Canadian program is divided into two parts—

research and management.

In July, 1952, the research program of the Fisheries Research Board, then in progress for a few years, was intensified and expanded in cooperation with other branches of the Dominion fisheries service and the Quebec Department of Fisheries. Its aim is to fill many gaps in existing knowledge of the Atlantic salmon and provide information needed for better management. Much of the program deals with the life of the fish in fresh water, especially better utilization of hatchery stock. Thus smolt runs are being trapped and marked, and the breeding capacity of various streams better ascertained. Other projects involve the study of hatchery-reared fingerling survival, especially planting techniques; the number of spawners required for full use of spawning areas; movements of salmon; extent of respawning; rates of growth of fish at various stages of development; and other biological studies.

The management program deals mainly with techniques to increase salmon stocks, including the enforcement of regulation, patrol of the rivers to protect spawners, removal of minor obstructions, and construction of fishways at dams and natural barriers. Key projects are pollution surveys, particularly the effect of pulp and paper mill wastes dumped into some of the finest fishing streams; development of better counting traps; etc. Hatchery work has been stepped up—about 7,300,000 fry and fingerlings were released in streams of the maritime provinces in 1953, and somewhat more in 1954. Surveys of major streams have been completed and the obstructions inventoried.

The Canadian restoration program is still in its beginning, and full results cannot be expected for four or five years. But the fishery biologists and management people are doing the best they can. The program is extensive but additional manpower and funds could certainly be used and techniques are always subject to improvement.

Industrial growth continues, especially the harnessing of waterflow for hydroelectric purposes, population is increasing, and deforestation goes on apace. Yet it is not too much to hope that the decline in the Canadian salmon fishery will not only be arrested, but perhaps an uptrend will result.

On the American side, the continuous removal of obstructions and cleaning up of the Maine streams, plus extensive restocking, should result, as Dr. Everhart says, in "a considerable sports fishery in many of the rivers." Anyone who has worked with the Atlantic Salmon Commission's field crews, witnessed the counting of salmon in the traps, and spent a few days in some of the rivers, must agree with him.



SOLILOQUY

Shula Hoffman

*I ask for neither wealth nor fame.
What matter gold or a well-known name?
It is enough that I should see
Red-tinged leaves on a dogwood tree.*



Must It All Be Lawn?

By GRACE E. BARSTOW MURPHY

The roadside is lined with wildflowers according to the season. In September, goldenrod, asters, milkweed, evening primrose and many others make an undercover for tiny saplings of many kinds.

→
The ever-changing variety and color along the road gives a lift and a delight that makes every turn in it a source of fresh enjoyment.



A TALL, wide-spreading pokeberry with red stems and dangling red fruit spikes grows against the post and rail fence on our quarter-mile-long road. Beyond, stands of autumn white asters are gracefully lovely under the trees. Beside the little pool near the house, a big clump of milkweed points slender green pods upward. It was not there last year. Its purple flowers are past, and its white silk showers of seeds are soon to come.

Along the road, there are stands of butter-and-eggs; a great sweep of heavenly blue chicory, which blossoms so well when cut low by a scything; late stalks of Queen Anne's lace; goldenrod in bud, in bloom, or past its blooming. There are evening primroses of a soft yellow; white sun-loving asters different from the shy shade-seeking kind under the trees. The sunny ones grow singly, but the shady kind grow in legions.

There are jack-in-the-pulpits holding up their heavy cylinders of close-packed red berries. Everywhere there is dayflower covered with flowers two pert blue petals of which stand upright above a yellow center. Visiting New Zealand friends were recently more impressed with the charm of dayflower than with anything they

had seen domesticated in gardens in parts of the U. S.

Many kinds of young trees stand on our stretch of roadway. There are baby walnuts, sassafras, dogwood, maple. There are little oaks, tupelos. Down by the gate there are slender locusts. In every sunny spot there is a little cedar. There are wine berries and blackberry bushes, woodbine stretching out its tendrils, and here and there a little bit of catbrier.

All the wildflowers along our road are as beautiful as any flowers that are grown in gardens. All garden flowers are to be found in their wild state somewhere—lilies of the valley in Swedish woods, dahlias in Mexico, fuschias and foxgloves along the country roads of southern Chile.

Yet our road is not a country road along which vegetation is usually left to grow at will. It is as long as it is only because our house stands behind our neighbor's pasture so that the fifty-foot-wide section had to be left for access. The road was built to wind prettily up and down over little risings of the ground before turning sharply left at last to bring us home.

Our community is one of many lawns. There may be people wondering why the Murphys do not replace their



The road ends at the bit of lawn that encloses the house. A natural foot-path leads to the beach on Long Island Sound, where the lovely vegetation is also undisturbed. Beach goldenrod is stunning when in bloom. The tall pole in the distances supports a martin house.

rangled roadside with some neat green grass. I do not know how many of these see the jewelweed or stop to pop its seeds. I do not know how many saw the thrilling purple nightshade when it bloomed. But we see all these things and love them. When a local policeman suggested that we use the roadside for angle parking before a party, I exclaimed in horror:

"Why, Captain, we have treasures there all the way from the main road to the house!"

Our neighbor solved the problem by suggesting that on the party day we take down two sections of his fence for parking in his pasture, which we did, with thanks. Our flowers and all our seedling trees came through unscathed.

Why is it that people want to kill such loveliness by building lawns? Lawns do untold damage to our wild-life—to vegetation, birds and animals. I doubt if lawns enrich the soil as does natural growth. Their grass is cut and usually carried off. They are fed, of course, but Nature's growth falls back on the land and feeds it without the aid of man. Deep vegetation holds moisture better, too, and must be better for the water table. There are more nesting sites for birds, more cover for our pheasants and our quail, more spots where little animals—raccoon and fox and more—may run.

It is granted that a little lawn is needed around the house. Ours, enclosed by trees except for one view-way to Long Island Sound, is an extra out-door room. But most of our six acres are in woods. What purpose is there in destroying woods to have a wide-spreading lawn that cannot replace the lovely things that should be growing where its unimaginative stretches lie? Why

should there be expense and labor for the cutting of the grass that need not be there? There are people who are slaves to cutting grass, instead of being poets to watch the gold of buttercups and cowslips, and the white of daisies in the spring. They may not even know the exultation of discovering the earliest anemone.

As I talked these thoughts, a friend, puzzled, said to me:

"But there must be a lot of land if there is to be natural growth." And I answered her:

"We brought our children up in our home in Westchester on a plot of land that was 100 by 150 feet. Behind the house we had an untouched tangle where we watched the wildflowers from earliest spring on into fall. The hardest thing that happened to us when we sold that house was the fact that the purchasers cut down the tangle and built more lawn."

In our section of Long Island, much of the undergrowth is mountain laurel. Sheets of its lovely flowers fill the woods each spring. Pink lady-slippers used to blossom freely in the woods. One sees them rarely now. The building boom is on, and all the wild things suffer. A few home-makers and house-builders save the laurel, but not enough remember the seedling trees which are as essential to continuance as are human children to the race.

The Nature Conservancy, in tireless devotion, is saving areas here and there, but if all the people could be awakened to the reality of treasure, much more could be saved. If a few set part of a lawn aside, letting Nature take her course, she could be relied on to bring many gifts of both plants and a variety of bird visitors.

As I wrote these notes, I suggested to my husband, "Let's walk down the road before I finish, to see what I have missed."

I forgot the grasses, legion in variety. I forgot the rose-flowered heal-all of the mint family, along the edges of the road. I forgot bush clover and the sumac, as I wrote, and also I forgot false indigo.

As we walked, my husband said: "There's nothing further here. Let's turn back."

"But look," I said, "there's a new one, and growing near it there is everlasting."

The "new one" has little flowers of cerise that flow downward into white, pea-shaped, with thrice-cut leaves like clover close-growing at far intervals on a slender stem. There is always something new.

On that September day, among our many kinds of wildflowers, we thought back through all the year to the ever-changing growth. Yes, the honeysuckle from Japan encroaches and is a burden to us, but with some care in spring and fall it can be kept from killing. And we will never, never, never, tear out wildflowers to sow grass and make more lawn.



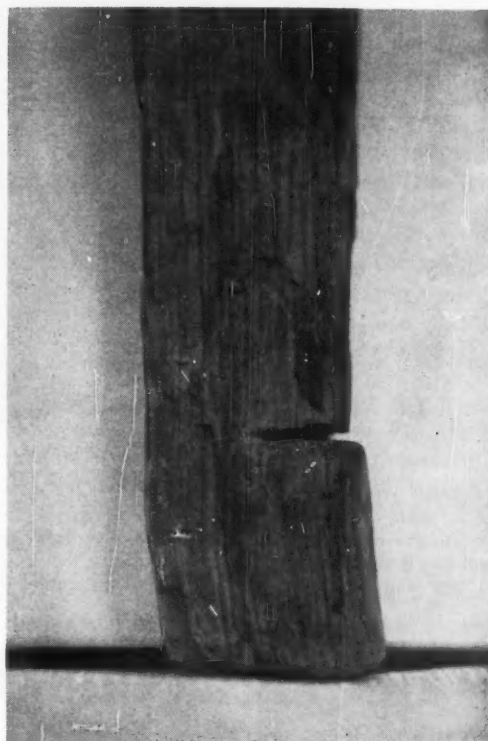
Mysterious "Saw Mark"

By SISTER MARY CORDE LORANG

WE HAVE in our fossil collection at Maryknoll Teachers College, New York, a piece of silicified wood with a strange "saw mark." It is the kind of a mark one would make, were one to hold a piece of soft wood flat on a support and saw, not up and down, but slantwise, for the cut is about twice as deep on one side of the specimen as on the other. On the deep side one can trace an area not yet cut but rubbed by the saw. The edges of the cut are slightly grooved as though the wood pulled along the grain as pine does while being sawed. The inner surface of the cut is about as smooth as a carpenter's saw would leave it. On this inner surface is a most interesting stain. It appears to be an iron stain and is found nowhere else on the specimen.

The history of this particular fossil is almost as interesting as its appearance. In the early 1800's, a Dr. Arthur A. Whitney practiced medicine in the Southwest. Frequently the Indians brought him interesting trinkets in gratitude, or as barter for brightly colored beads and cloth. Dr. Whitney recognized many of the objects brought to him by the Indians as valuable semi-precious gems, chert nodules of fantastic shapes, and many fossils. He had little time to work on the large collection he assembled during the years, but wrapped each piece neatly and packed it away. For some reason, he did not give the collection to his sons when he finally disposed of it, but divided it into five somewhat equal parts and thus distributed it to his five grandsons. Four of the parts were almost immediately sold or given to museums. The fifth portion was merely stored away, box, wrappings and all, for the next twenty years. And so it was that when, about eight years ago, this collection was given to our college, we had the odd experience of bringing it to the light of day for probably the first time in many decades. Almost all of the pieces have since been identified by the Smithsonian Institution and make a varied collection.

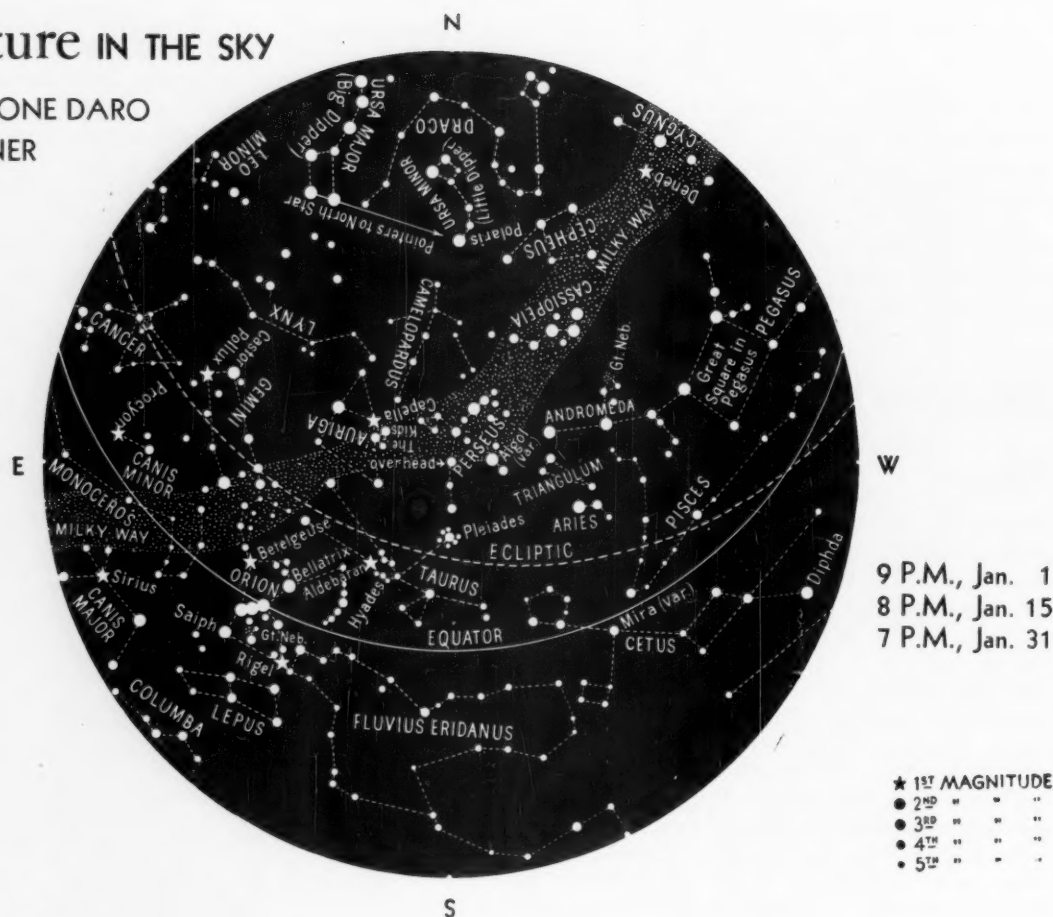
By far, the greater number of the fossils are from the Paleozoic Era, with only a minority from the Mesozoic. None has definitely been placed in the Cenozoic, although the fossilized wood may, in some cases, belong to this era. The only information we have been able to obtain regarding the fossilized wood specimen bearing the



"saw mark" is that it *is* a fossil. This raises interesting questions such as how long does it really take wood to fossilize? Need it take thousands of years? Could it be done in hundreds? How long ago was a metal saw used on this piece of wood? Or was it a metal saw? Could any other kind of material have left the iron-like stain on the interior of the cut? If a metal saw was used, and if it was used before the wood became fossilized, how long ago was that? Who did it? Was it the Sweetwater Man? Was it a more culturally advanced neighbor? Could it be that some twenty-five thousand years ago, a man in the southwestern area of the United States used a metal saw on wood? As far as I have been able to ascertain, these questions are unanswerable at the present time, but that is what makes our fossil so interesting.

Nature IN THE SKY

By SIMONE DARO
GOSSNER



9 P.M., Jan. 1
8 P.M., Jan. 15
7 P.M., Jan. 31

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the

map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

The Heavens in 1956

THE PAST year has been marked by the occurrence of two large solar eclipses, and a well-defined increase in solar activity.

Inclement weather frustrated the hopes of many observing parties at the total eclipse of June 20, 1955. Those located in Ceylon, particularly, encountered cloudy skies, although the Harvard Observatory party managed to secure records of the infrared spectrum of the corona. A Swiss party was so completely clouded out that, according to *Sky and Telescope*, "after the eclipse, the disappointed Swiss astronomers flew their national flag at half-mast." Conditions in the Philippines were somewhat better, fortunately. Photographs of the solar corona were obtained at Manila. A U. S. Air Force T-33 jet trainer flew at 600 miles per hour along the track of totality, thus stretching the duration of

totality to eleven minutes. During this flight Dr. Frank Back of New York obtained seven spectrograms of the corona.

As this is being written, the annular eclipse of December 14, 1955, has not yet taken place. We can only wish the best of luck to the observing parties.

By the end of October, 1955, nine comets had been reported for the year. Of these two were recoveries of periodic comets, and six were new discoveries, although one of them, 1955b Renner, has not been confirmed. The ninth one, 1955i Mrkos, has been tentatively identified as Periodic Comet Perrine, first observed in 1896 and again in 1909. Two of the new comets were of particular interest because they were bright enough to be seen with the naked eye, and many observations were reported.

Of the periodic comets recovered in 1955, the first one was Comet Ashbrook-Jackson, discovered in 1948. This is its first observed return. The other one was Periodic Comet Whipple, originally discovered in 1933. This is Comet Whipple's fourth observed return. Both comets were extremely faint and could be found mostly because good predicted positions were available.

The year 1956 will undoubtedly witness the continued increase in solar activity. The 1956 solar eclipses, on the other hand, are not very promising. There will be four eclipses in all, two of the sun and two of the moon.

On May 24, there will be a partial eclipse of the moon; on June 8, a total eclipse of the sun; on November 18, a total eclipse of the moon; on December 2, a partial eclipse of the sun. Of these, only the lunar eclipse of November 18 will be visible in the United States.

It is true that, on the average, eclipses occur more frequently over water than over land, for the simple reason that the oceans cover about four-fifths of the surface of the earth.

But the total solar eclipse of June 8 is, without a doubt, one of the most frustrating in that respect. The path of totality will fall entirely over the south Pacific Ocean, without touching any land whatsoever, not even the tiniest island. To add insult to injury, the area covered by the partial phase will do almost as badly. The western boundary of the eclipse will barely fail to touch the east coast of Australia, whereas the eastern boundary will not quite reach the west coast of South America. The only land included will be New Zealand and some scattered islands—Samoa, the Tuamotus, and a few others.

The partial solar eclipse of December 2 will be visible in most of Europe and Asia, with the exception of Spain, the British Isles, and the east and southeast coasts of Asia. The northeast coast of Africa will also see a small phase of the eclipse. A maximum phase of eighty percent will be observable in the horizon at a point on the northern coast of Siberia, southeasterly from Novaya Zemlya.

The partial lunar eclipse of May 24 will come close to being total. Ninety-seven percent of the Moon's diameter will be covered by the shadow of the earth. The whole phenomenon will be seen from beginning to end in central and southern Asia, the west Pacific Ocean, the Indian Ocean, Australia and Antarctica. The Aleutian islands will see only the beginning, while most of Africa, Asia Minor and southeast Russia will have a glimpse of the end.

The total lunar eclipse of November 18 will be visible here in its entirety. Totality will last one hour and 19 minutes. The entire run of the phenomenon will be visible in the Western Hemisphere and in the Arctic regions. Most of Europe and northeast Africa will see

the beginning only, while northeast Asia and the extreme northeast coast of Australia will only see the end.

An important event of 1956 will be the closest approach of Mars to the Earth since 1924. This will occur at midnight, Eastern Standard Time, on the night of September 6-7. At that time, Mars will be about 35 million miles away from us and its magnitude will be -2.6, exceeded in brightness only by Venus and the Moon.

It takes Mars 687 days, or approximately two of our years, to complete a revolution around the sun. Thus

once every other year it will be on the far side of the sun, that is, in conjunction, with respect to us at an average distance of 235 million miles. And once on each of the alternate years it will be behind us, that is, in opposition, with respect to the sun at an average distance of 49 million miles. Not all oppositions are equally favorable as we shall see. The distance from Mars to the sun varies throughout the martian year from a minimum of 129 million miles at perihelion to a maximum of 154 million miles at aphelion. Ac-

cordingly, the least distance of Mars to the Earth in each two-year cycle will vary depending on the position of Mars in its orbit at the time of opposition. If Mars happens to be near aphelion, the least distance may be as great as 62 million miles. This was the case in 1948, for example. In 1956, on the contrary, Mars will be at perihelion on August 21, less than three weeks before its opposition on September 10. The near approach on September 7 will thus be most favorable. It is the first favorable approach since 1939-1941, and the closest since 1924.

Many observatories, here and abroad, made preliminary observations at the 1954 opposition in order to be fully prepared for this event. Among the many problems they hope to tackle is that of the dark markings on the surface of the planet. These markings are the famed "canals" of Schiaparelli, which many astronomers of the 1890's thought to be man-made. This lively controversy has never really been settled, and there is no doubt that the ink will flow again this year.

In 1956, Mercury will be at its greatest eastern elongation, and most favorable for observation in the evening twilight on January 11, May 2, August 31, and December 25. It will be at its greatest western elongation in the morning sky on February 21, June 20 and October 12.

Venus will start the year as an evening star, reaching its greatest eastern elongation on April 12, and its greatest brilliancy on May 16. It will enter the morning sky on June 22, when it will be in inferior conjunction with the sun. It will then reach its greatest brilliancy as a morning star on July 29 and its greatest western elongation on August 31.

In the month of January the New Moon will occur on January 13, and the Moon will be (continued on page 50)

SMALL MYSTERY

*I always straighten a bended stalk
That's beaten down by my garden walk,
And tie it up to a stick or stake
Or broken length of a garden rake,
Until it's strong and can stand alone.*

*But why I must is never known
Unless by God and the helpless stalk
The rain beat down by my garden walk.*

Nellie S. Richardson

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University,
and Director of Nature Education, The American Nature Association

Marine Mammals in School

ASK THE AVERAGE school boy today to name and describe the largest animal that ever lived and he will probably suggest some dinosaur. Of course he will be wrong because the largest animal that ever lived, the blue whale, is still to be found living today. This may not continue to be the case because, within the lifetime of persons now living, this animal might become exterminated unless, as suggested in our special insert, some substitutes for what we get from whales may be found. It would not be a credit to our generation should this animal go.

Substances commonly found in every home and town may well trace their ancestry directly to some marine mammal. Possibly the most obvious may be a sealskin coat, probably worn by some old lady to whom it may well be a highly prized possession. Less obvious would be the soap, which may have whale oil in it, and possibly still less obvious is the whalebone that is still used in the making of corsets. If you wish to start exploring what is gotten from whales and seals you may be surprised in what you find. Some suggestions that may be helpful are to be found in the current insert.

Some may remember the play *Journey's End*, which was so successful at the end of the first World War. If you do you may remember in it the scene where a school teacher and a schoolboy found themselves face to face, about to go over the top. One of them commented "The time has come," the Walrus said, "To talk of many things;" "he stopped right there and his partner continued, "'Of shoes- and ships- and sealing wax- and cabbages- and kings.'" Then, alternating, they continued, "'and why the sea is boiling hot and whether pigs have wings.'" Another soldier, listening, observed that they must have gone crazy and yet their ability to quote readily from Lewis Carroll's *Through the Looking Glass* set the two groups apart.

Lewis Carroll's walrus

Possibly *Alice in Wonderland* and *Through the Looking Glass* may seem to be nonsense when it is first read and yet as we grow older its double-talk becomes tremendously intriguing. Certainly knowledge of these books is part of the cultural background of English-speaking folk the world over, and the walrus plays a part of some importance. Why not learn more about walrus while you go through *Wonderland* with Alice? There are those who will say that it is ridiculous to waste time on talking walrus, but those same persons probably can see nothing in Santa Claus, Peter Pan or *A Midsummer Night's Dream*. I am afraid I will have only pity for them.

Not too far distant from the time when this reaches teachers, the Lenten season will begin. It might be interesting to explore how marine mammals have fared due to the religious restrictions of the season as to eating meat and fish. In many parts of the world a whale was held as a fish and not as a mammal. The same held for a number of other animals that are really mammals and not fish, although they may have the form and many of the habits of some fishes. The whale is frequently considered as a huge fish, not only by Simple Simon but by many learned folk whose training in biology may have been somewhat circumscribed. This is no reflection on their intelligence, of course.

Whales in literature

Teachers who wish to associate literature and geography may find *Moby Dick* and Kipling's story of the White Whale profitable vehicles for learning about the world. Let some youngster read either story and tell it to the class, using maps to plot the setting properly. In fact, the school library undoubtedly will contain many stories of whaling experiences that unquestionably will appeal to some youngsters. If so, use this appeal to help them understand their geography better.

A few years ago one of the most popular high school general science

texts, written by a "big shot" in the field, gave some consideration to whales, and then commented to the effect that it might be well to take up the study of "some other fish." Science texts should be most useful in understanding whales. Think of the tremendous pressure that must have to be met by an animal that can dive to depths of more than a thousand feet. The insert section may help you understand how this is possible, and what structural differences appear in the deep divers and in the shallow divers.

Should you be interested in teaching the physiology of animals you will find the marine mammals well worthy of consideration. The story of the ability of these animals completely, or almost completely, to renew the air in their lungs following dives; the story of changes in their respiration and pulse when submerged and at the surface; the story of what happens to carbon dioxide in their systems all can better be understood by the school person well instructed in the field of science. This may be a two-way proposition in that while the appeal these animals have for some may create an interest in some aspects of science, the reverse may also be true.

Encouraging kindness

School should not overlook the possibilities these animals offer in teaching kindness to dumb animals, and in encouraging humanitarian treatment associated with their commercial harvest. Anyone who has visited Marineland in Florida and witnessed the dolphins that have become tamed there, or anyone who has watched the dolphins play across the path of a sea-going vessel must develop some feeling of kinship with these animals, who might almost be said to live in another world. Their kindly treatment has brought interesting results. On the other hand, the brutal treatment whales and seals get at the hands of these who kill them should give us all pause for thought. How we can justify skinning a seal alive because of the fact that it is easier that way due to muscular reactions is hard to understand.

I hope that teachers will not overlook the parts these creatures have played in folk lore, particularly in the Scandinavian countries.

Those interested in anatomy will find whales and seals most worthy of study, even if we confine ourselves

to such obvious parts as the teeth. Even in the whales there are such great variations between those that feed on plankton, strained from the sea through whalebone, and the feeding habits of killer whales, that opportunities are almost limitless. Do not pass them up.

Of course, there are words in our language that reflect our relationship with marine mammals somewhere in our background. "Thar she blows" may well be the best known of these. How many can you discover? It might be a "whale" of an idea.



Threatened Species

To study the status of seriously threatened species of wildlife, the Survival Service of the International Union for the Protection of Nature sent Lee Merriam Talbot, California ecologist, to the Middle East and southern Asia. Particularly studied were the Asiatic rhinoceros, the Indian lion, the Arabian oryx and the Kashmir stag. All of these animals are making their last stand in areas severely restricted compared to their original ranges. The rhinoceros became reduced in large measure due to Oriental beliefs that its horn and other parts of its body held magic powers. The oryx was ruthlessly hunted by the Arabs, to have killed one of the animals being a mark of prestige. The Indian lion provided royal sport to the point that about 240 individuals remain in the Gir Forest north of Bombay. This is the lion mentioned in scriptures and carved in ancient friezes. The future of these animals depends upon rigid protection and I.U.P.N. is seeking to work with the governments involved to that end.

Clarendon Gardens

Although specially noted for its fall flowers and its magnificent growth of hollies, Clarendon Gardens, located about a mile from Pinehurst, North Carolina, has established a considerable name for itself as a bird haven. Some 100 species have been identified there by bird watchers. This show place of Nature is the culmination of a lifelong dream of Francis W. Howe, a Buffalo, N.Y., businessman. Specializing in broadleaved evergreens, he has now more than 200 varieties established in the Garden.

Bulletins

"Geology of Olympic National Park" by Wilbert R. Danner is a 68-page, illustrated booklet published by the University of Washington Press, Seattle 5, Washington, and is available for \$1.25.

"The Bald Eagle and Its Economic Status" by Ralph H. Imler and E. R. Kalmbach is a 51-page illustrated booklet published as Circular #30 of the U.S. Fish and Wildlife Service and is available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., for 30 cents.

"Relative Abundance of Maryland Shad, 1944-52" by Charles H. Walburg is Research Report #38 of the U.S. Fish and Wildlife Service, available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., for 15 cents.

"What You Should Know about Lumber" is a 24-page pamphlet published by the National Lumber Manufacturers Association, 1319 18th Street, N.W., Washington, D.C. Free.

"Tennessee's Timber Economy" by Herbert S. Sternitzke is Forest Resource Report #9 of the U.S. Forest Service, for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. for 55 cents.

"Evaluation of Three Types of Fish Rearing Ponds" by Roger E. Burrows and Harry H. Chenoweth is Research Report #39 of the U.S. Fish and Wildlife Service, for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., for 15 cents.

"Directory of Organizations and Officials Concerned with the Protection of Wildlife and Other Natural Resources" is a valuable 62-page booklet published by the National Wildlife Federation, 232 Carroll Street, N.W., Washington 12, D.C., for 25 cents.

"Guide to the Winter Birds of Colorado" by Richard G. Beidleman is a 60-page illustrated bulletin. Drawings are by Dominick O. D'Ostilio and photographs by Walker Van Riper. It is published by the University of Colorado Museum, Boulder, Colorado, for \$1.00. plus 5 cents postage and handling.

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THE Nature CAMERA

By EDNA HOFFMAN EVANS

January and Snow

JANUARY IS USUALLY a good month for snow pictures. By this time each winter the white stuff has been with many of us for several months, and we can view it with an experienced eye. The novelty has worn off and we can select our scenes with care, instead of shooting with haphazard delight as we did when the first snowfall of the season occurred. On the other hand, winter has not been with us so long that we are heartily sick of it and anxious for spring to come. Thus, January—even thought it does usher in the New Year calendar-wise—stands about midway between the first chill blasts of winter and the balmy breath of spring. It is a good month for cold weather picture-taking.

Ordinarily, our color association reaction to the word "snow" is the word "white." This reaction continues until we have had considerable photographic experience, and probably a few disappointments, with the fluffy white stuff. But after a while, if we are camerawise, our color association with snow is not

"white" at all; instead, it is "blue."

On sunny winter days the shadows on snow reflect tremendous amounts of blue from the sky above. This is also true on dull days when the sky is overcast. Of course, on gray days, the shadows are not nearly so pronounced. None the less, blue is the color we must associate with snow. And blue is the color we must contend with when we take outdoor photographs in winter.

Black-and-white film is extremely sensitive to blue. Thus, blue-toned shadows will expose almost as heavily as the rest of the snow-covered surfaces. Contrasts extremely apparent to the eye will be lost when recorded by the camera lens. Accordingly, scenes that look attractive to the eye, and which continue to look attractive when viewed through the groundglass or focusing device, will appear flat and uninteresting when viewed as photographic prints. I know from sad experience; I have "lost" a number of snow scenes that way.

Yellow filter needed

The situation, though, is an easy one to remedy. A medium yellow



In printing this picture, the foreground received 20 seconds of exposure while the background was exposed for 8 seconds. This was necessary in order to bring out the shadows.

filter—Wratten K2—will do the trick, for yellow is "minus blue" in the spectrum. A yellow filter will absorb the blue skylight and allow the shadows to be recorded on the film as medium gray values. This K2 filter is one that outdoor camera enthusiasts should have among their photographic equipment, for it is one that can be used to obtain full correction on many outdoor subjects. Not confined solely to winter scenes, the K2 filter is widely used for proper sky, cloud, and foliage rendering in spring, summer, and fall as well.

For more striking effects a G15 deep yellow filter (often called an orange filter) will be of service. This filter gives a deeper sky rendering; it also cuts haze, enhances texture, and provides extra contrast for outdoor subjects. Used on snow scenes, it deepens the shadows and makes them more distinct than does the K2.

If extreme contrast is desired—almost to the extent of tone distortion—a red (G25) filter is the one to use. This filter renders blue skies almost black, and does the same for blue shadows. But the photographer should remember that the denser the filter, the wider he must open his camera lens, or the greater must be the length of his exposure time in order to compensate for loss of light.

From the foregoing discussion of filters and blue shadows it should



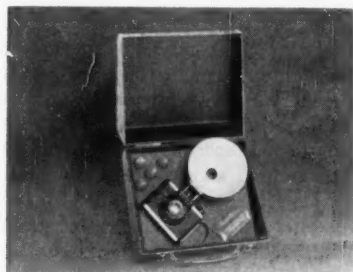
This is an "unfiltered" shot. Use of a filter would have given much more emphasis to the shadows. In color, the scene is much more effective than it is in black and white.

be obvious that shadows are particularly important in snow pictures. Without them, a winter scene is flat and lifeless. Thus, in order to take good pictures it is necessary that the photographer employ a technique somewhat different from the one he used last summer when he stood with his back to the sun and let the light fall full on his subject.

Now that winter has come, the cameraman should not turn his back to the sun. Instead, he should turn at right angles to it, or, if not a full ninety degrees, at least enough so that shadows will fall across his picture. This is called cross-lighting, and it is a device that tends to bring out the typical gem-like sparkle that we expect from glittering snow crystals.

Backlighting is effective

Backlighting, too, is effective in snow pictures. To obtain this effect

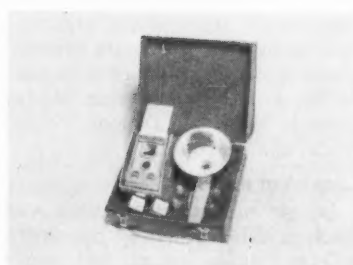


The Anso Readyflash traveler is the least expensive of Anso's new 1956 trio of package outfits.

the photographer should shoot toward the light source—making sure, of course, that the light does not shine directly into the camera lens. When properly done, backlighting causes the shadows to fall directly toward the camera, it rims the subjects with light and gives them a halo-like glow, and it also gives the snow a distinctive sparkling texture.

The time of day for picture-taking is also important. High noon, with the sun overhead, is never a good time for pictures, regardless of the season. In winter, especially, early morning and late afternoon are best times for picture-taking for then the shadows are long and distinct. A sunny day, of course, is much better than a dull one. In fact, some experts advise no picture-taking at all on dull days, unless it is absolutely necessary for record purposes.

Photographic techniques that hold



The Anscoflex II traveler outfit includes twin-lens camera, with a built-in filter and a portrait lens flash attachment, four bulbs and two rolls of film.

true for black-and-white film are also important in color photography. Snow pictures are extremely effective in color; more than that, it is amazing the number of colors the camera can detect in a snow scene. Here, again, early morning or late afternoon light is best. With the sun at a low angle, the light skims across the landscape and from it the snow takes on tones of pink, orange, blue, and yellow. Sunset's rosy tones are most pronounced on an expanse of snow, while the warm glow of lighted windows in early evening gives pictures of unmatched beauty.

There is something about winter sunlight—its crisp clarity, perhaps, unmarred by the leaf patterns and dappled shade of summer—that produces a color picture too beautiful for word description. Beautiful backgrounds become even more so in winter, with the contrast of snow against stone, or bare trees, or evergreen foliage. For example, the Grand Canyon of Arizona is beautiful to the eye and to the camera in spring and summer and autumn—but in winter, I think, it photographs most beautifully of all.

Filters for color film

There are filters designed for use with color film, too. Those which seem most efficient for winter pho-



Most expensive of the trio, the Anso Memar outfit sells for \$56.25.



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tography are the Eastman manufactured Skylight (1A), and the Ansco UV-16. Both of these filters are recommended for use in daylight, to overcome bluish tones from overcast or open shade, or with distant scenes and in mountain and aerial photography. On clear or hazy days when the sun casts sharp or soft shadows, no filter is required for effective color photography.

There are numerous possibilities for outdoor photography in winter. Even scenes that are ordinarily far from attractive can be made beautiful by a soft concealing blanket of snow. But in photographing winter scenes, be sure that there is some center of interest on which the eye may focus. Remember that while a vast expanse of snow, stretching endlessly into the distance, may appear impressive to the eye, it becomes dull, uninteresting, and pictorially worthless when imprisoned on film.

Sometimes a smooth, unbroken snow surface is desirable. At other times tracks in the snow—even those made purposely by the photographer himself—will serve to relieve an otherwise uninteresting foreground. This is particularly so if the light falls at such an angle as to throw the depressions into shadow.

Animal tracks in the snow make interesting subjects—rabbit tracks, deer tracks, bird tracks, mouse tracks. Even the tracks made by windblown grass stalks and branches are effective if properly lighted, (or if emphasized by shadows) and each can tell its own story of some winter activity. So do icicles, as they hang from frozen branches, or overhanging caves, or from telephone poles and wires.

Photography from a blind in winter has many drawbacks, in the form of numbed fingers and toes, even frostbite. However, it has been found by some photographers that a white sheet, draped over head and body, will serve as an effective camouflage and will permit the cameraman to stalk his quarry with remarkable ease.

After the exposure has been made and the film developed, the photographer can further enhance his winter pictures by carefully selecting the paper on which he makes his final prints. Here again, as in the selection of the filter, the proper choice can make a big difference. Because of the way in which they

react to the tones of the negative, the following papers are usually recommended for the reproduction of snow scenes: Eastman Kodabromide E or N, Dupont Velour Black, and Ansco Jet.

Cameras of the New Year

In line with the trend that was much in evidence during the recent holiday season, more and more "package" camera outfits are making their way onto the market. Good examples of this are the three 1956 Ansco camera outfits, each of which is available in a cowhide grained, leather-like gadget bag called the Ansco Traveler carrying case.

Least expensive of the trio is the Ansco Readyflash traveler outfit which includes the Readyflash camera, flash attachment, four bulbs, one roll of film, and the traveling case. The outfit is priced at \$10.85.

Second is the Anscoflex II traveler outfit, featuring the gray twin-lens camera with built-in filter and close-up portrait lens, camera case, flash attachment, four flashbulbs, two rolls of film and the carrying case. The cost is \$27.95.

Most expensive of the kits is the Ansco Memar outfit. This includes the Memar 35 mm camera, camera case, flash attachment, and a roll of Anscochrome film. Retail price, with carrying case included, is \$56.25.

And let me note here the passing of an old and faithful friend. That is the Kodak Super XX film, the manufacture of which has been discontinued by the Eastman Company. Super XX was, for years, the nation's most popular high-speed film, but research has produced a newer, faster film—Kodak Tri X—that is twice as fast as the XX film. For medium speed uses, Plus-X film is now recommended. Its exposure index has been increased to 80 daylight and 64 tungsten. So "Super-double" is no more. May its memory rest in the halls of some photographic Valhalla. ♪ ♪ ♪

Ducks

(continued from page 20)

it, the gopher was keeping up its strength, satisfying its hunger.

As an adult with children of my own, with a modern adult's heavy concerns, I often think of the will-and-means-to-live of simple plants and animals.

"Consider the lilies how they grow. . . O ye of little faith."

Surely Man, heir of two billion years of such faith, with fellow creatures such as these, will live beyond the ordeal of the Age, will live beyond himself! ♪ ♪ ♪

Amber

(continued from page 24)

Columbia University. He became an electro-chemical engineer, specializing in dry battery construction, and is an authority on manganese.

Married in 1923 to his wife, Catherine, a laboratory technician, he lives quietly in a home in Jackson Heights, Long Island. He is the father of five children, three boys and two girls. The eldest son, Robert, has just been ordained priest in the Paulist Order. Another son, Jerome, a paratroop instructor in the armed forces, is majoring in sociology. Mary, majoring in mathematics at Fordham University; Jane, a high school student, and George, 8th grade completes the family group.

If Mr. Baer has a hobby besides his family, it is his business. Most of his leisure time is devoted to studying the history of amber, and his working day to producing, marketing and building up the popularity of amber jewelry in this country. His business is unique in that it is non-competitive within the United States—Amber Guild, Ltd. controls almost all of the imports of raw amber and the cut gems and jewelry made in Europe. His plant on Long Island houses a group of artisans who produce all of the amber jewelry made here.

Mr. Baer feels that the supply of amber is not inexhaustible; that the known supplies may be exhausted within fifty years. Unless new deposits are found, which he deems unlikely, the very scarcity of gem amber may make it one of the rarest and costliest of gems.

So, hang onto any amber jewelry you may have in your jewel case. It may be the best legacy your grandchildren can receive from you. ♪

Skies

(continued from page 44)

full on January 27.

Mercury will reach its greatest eastern elongation on January 11, setting in the southwest about an hour and a half after the sun on that date. It will enter the morning

sky on January 27.

Venus will be seen after dark in the southwest, setting three hours after the sun on January 15.

Mars will rise in the southeast about three and one-half hours before the sun on January 15. By the end of the month it will be found approximately five degrees north of Antares.

Jupiter will be found in Leo, just to the east of Regulus. It will rise about three hours after sunset on January 15, will pass nearly overhead, and will still be seen above the western horizon at dawn.

Saturn, in Libra, will rise about four hours before the sun on January 15, and will be seen low on the southeastern horizon at dawn.

The Earth will be at perihelion on January 2. This is the point of its orbit where the Earth comes closest to the sun.

For Bird Problems

"Solving Your Bird Problems" is a practical little booklet that is exclusively printed and sold by the Conservation Council of Eastern Pennsylvania. All profits from the sale of this 32-page publication are devoted to the maintenance of the Washington Crossing Park bird programs. The Nature Center at the Park is three miles north of Washington Crossing, Pa., and on River Road in the Bowman's Hill part of the area. All bird programs, which have attracted thousands, are free, although contributions of sunflower seed, wild bird feed, stale bread, or suet are welcomed. Copies of this interesting little booklet are available at 35 cents a copy (3 for \$1.00) from Mrs. Robert B. Taylor, 525 Broadacres Road, Penn Valley, Narberth, Pennsylvania.

Big Bend Dedicated

Although it was the 27th National Park, being acquired before Everglades, Big Bend National Park was not formerly dedicated until November 21, when Secretary of the Interior Douglas McKay delivered the principal address. Dedication was delayed because of World War II and the Korean War. Among those taking part in the ceremony were Governor Allan Shivers of Texas, and Governors of the neighboring Mexican States of Coahuila and Chihuahua were invited to be special guests.

Bulletins

"First Aid and Care of Small Animals" by Ernest P. Walker is a 46-page, illustrated booklet by the Assistant Director of the National Zoological Park and is published by the Animal Welfare Institute, 350 Fifth Avenue, New York 1, N.Y.

"Life and Death of the Soil" by Robert C. Sherman is a 48-page booklet published by Science Research Associates, 57 West Grand Avenue, Chicago 10, Illinois. Sold for sixty cents.

"The Seals, Sea-Lions, and Sea Otter of the Pacific Coast" by Karl W. Kenyon and Victor B. Scheffer is a 34-page booklet issued as Circular 32 of the U. S. Fish and Wildlife Service and is for sale by the Superintendent of Documents, Washington 25, D.C., for 20 cents.

"Botanical Studies in Fiji" by Albert C. Smith is Publication 4201 and "The Romance of Domesticated Plants" by Glenn W. Blaydes is Publication 4202, both of the Smithsonian Institution, Washington, D.C.

"The Biology and Ecology of the Red-Headed Sawfly" by Daniel Benjamin is Technical Bulletin No. 1118 of the U. S. Department of Agriculture, for sale by the Superintendent of Documents, Washington 25, D.C. for 20 cents.

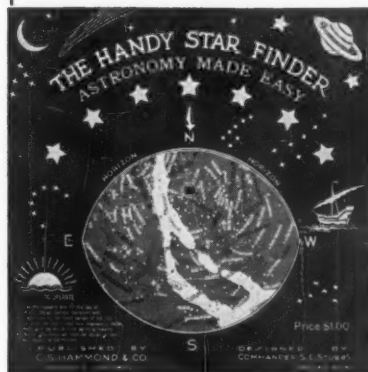
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Apus

(continued from page 14)

Most animals evolved to meet the needs of changing climatic conditions, or perished. *Apus* did neither, but simply continued to live in places where conditions continued to resemble those of the Triassic. In humid western Europe these shrimps are seldom found, but in dryer eastern Europe and Asia they persist in larger numbers. Drought-subject regions of Africa and Australia provide a home for numbers of *Apus*.

One wonders what secrets man can wrest from the animal that would not evolve; a water-dweller of the sere wastes of hot deserts; a curious holdover from the shadowy past. ♪

"Bird Watchers"

(continued from page 16)

about which there were strong currents, wherefore they called it Straumey [Stream Island]. There were so many birds there, that it was scarcely possible to step between their eggs." Here they wintered, and of the following spring the saga relates that "the weather, then, improved and they could row out to fish; thenceforth they had no lack of provisions, for they could hunt game on the land, gather eggs on the island, and catch fish from the sea."

Careful study of this saga has led to the identification of Straumey Island as probably Grand Manan, just off the extreme eastern end of Maine, where the swift tides of the Bay of Fundy would justify its name of Stream Island. Even today some of the islands near Grand Manan are noted for their bird rookeries. Kent Island, one of the group, is now an ornithological field station of Bowdoin College and supports a large population of eider ducks and herring gulls, the eggs of both of which species were a staple article of food of the Scandinavian peoples. In colonial times gannets bred in considerable numbers on a rock near Grand Manan, and one of the finest colonies of Atlantic puffins south of Labrador is still located nearby. These latter birds, like the eiders, have prospered under protection in recent years, although the gannets were extirpated as nesting birds long ago from the Fundy region.

We pass from the realm of tradi-

tion and the ancient sagas to historic times with the first voyage of Christopher Columbus in the autumn of 1492. We may well ponder the effect of *birds* on Columbus' travels and speculate on what might have happened had he not chanced to make his epochal voyage at the very season when the autumnal migration was at its height and small feathered folk were making their remarkable flights southward. [See *Nature Magazine*, October, 1955] Columbus' diaries tell the story of the slow journey into unknown waters, where he even feared to put down in his daily log the actual distances traveled each day lest his fearful sailors refuse to continue farther into seas from which they were afraid there would be no return. How gladly they noted slight indications of the nearness of land, flotsam on the wide waters, bits of driftwood, green twigs. And then the small birds came and passed them by, steadily winging toward an unseen goal, and the mutinous crew became reassured that land was near, for the tiny wings of the birds could not support them long across the trackless waters. Let me give a few extracts from Columbus' own records;—

"Sept. 18. This day Martin Alonzo, with the Pinta, which was a fast sailor, did not wait, for he said to the Admiral, from his caravel, that he had seen a multitude of birds flying westward, that he hoped to see land that night. . . Sept. 20. Many land birds. . . Oct. 3. No birds. . . Oct. 4. More than forty sandpipers in a flock. . . Oct. 7. No land seen during the afternoon, but passed a great number of birds flying from N to SW. The Admiral was aware that most of the islands held by the Portuguese were discovered by the flight of birds. For this reason he resolved to give up the west course, and to shape a course WSW for the two following days. . . Oct. 8. Many land birds. . . Oct. 12. The vessels were hove to, waiting for the morning. They arrived at a small island, called, in the language of the Indians, Guanahani."

So we find that it was the passing of small birds on their annual migration that brought Columbus to his first landfall in the Bahamas. Had he made this initial voyage a few weeks earlier or later, the "discovery" of the western world might have been delayed many years.

"Bird watching" thus paid one of its biggest dividends of all time. ♪

Burgess

(continued from page 19)

editor of *Good Housekeeping*.

It was when he was thirty-five that he decided he had reached a crisis in his life. He was not in debt but he was not able to save anything. He decided he could not stand still any longer.

In 1911 he made one of the big decisions of his life. Great success, he believed then as he does now, comes from attempting the seemingly impossible. Mr. Burgess left the security of his job and determined to work from then on for nobody except himself. He would write.

His stories proved exceedingly popular. Farm boys gave up trapping when they read his stories of wild animal life. Children begged for a bedtime story and then slept peacefully, dreaming of the green forests and the kind animals who lived there—Bobby Coon, Danny Meadow Mouse, Jimmy Skunk, and others.

Quietly, without fanfare, Mr. Burgess wrote and lectured and made thousands of friends. In the summer of 1918 nearly ten-thousand youngsters in Kansas City turned out to hear "The Bedtime Story Man" tell a few stories, and talk to the children about approaching animals.

His books, superbly illustrated by Harrison Cody, have since appeared at a rate of more than one a year. He founded Nature clubs and told youngsters over the radio how to build a wren house or to thaw out a chilled robin.

And now nearly eighty-two, Mr. Burgess is working on his autobiography. "I don't think it'll be too interesting," he modestly told me.

But those who were brought up on Burgess animal stories, and now read them to their own children, will certainly disagree with that conclusion. ♪ ♪ ♪

Muskoxen Increase

In 1935 and 1936 thirty-one muskoxen were released on Nunivak Island, Alaska, the animals having been purchased in Greenland. According to the U. S. Fish and Wildlife Service the herd now numbers 116.

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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

Meteorological Optics

8. Rainbow

THE MOST spectacular atmospheric phenomenon known to everyone is the *rainbow*. In this beautiful optical illusion, dispersion is the obvious physical event, giving rise to a colossal spectrum that arches across the heavens to produce one of Nature's most glorious exhibitions. At sea, with no land masses to interfere, the semicircle is complete and, under favorable circumstances, extremely brilliant and exquisite.

Many have been the attempts, from ancient times, to explain this apparition, and, as we may anticipate, early efforts were metaphysical. Iris, Goddess of the Rainbow, filled the clouds with moisture gathered from the sea, the lakes, and rivers, and released it over the farmer's fields. Riding on a rainbow, she was a female counterpart of Hermes and a messenger of the gods. Early scientists managed to dispense with Iris, but found the problem insoluble.

First to present a reasonable interpretation, using geometrical optics, was Rene Descartes, in 1637. The great French philosopher, scientist, and mathematician (1596-1650), inventor of analytical geometry, gave an exposition that was elementary and incomplete, but certainly a start in the right direction. New-

ton, in his *Optiks*, 1704, provided an illustration still used today and reproduced herewith, the explanation of which follows:

Three conditions must be fulfilled in order for one to see a rainbow. The observer must have his back to the sun; the sun must be low in the heavens; and rain must be falling in front of the viewer—from that part of the sky opposite the sun. Thus rainbows are phenomena of morning and evening and not of midday. Parallel rays of light from the sun strike raindrops that, at any given instant, are in such position as to reflect these rays to the observer's eye, as shown in accompanying illustrations. But the events are not merely those of reflection as from a mirror, and we shall have to call upon all of the effects previously noted in our series on prisms, and then achieve only a partial explanation.

Raindrop is a lens

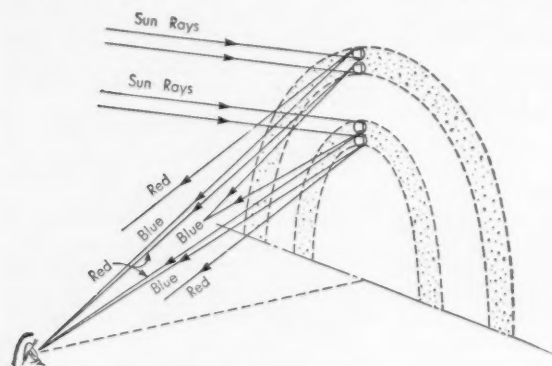
A biconvex lens is equivalent to two prisms placed base to base, with regard to its transmission of light rays; a raindrop is an extremely convex lens—in fact, a spherical one—and its capacity to bend entering light rays is thus great. And so the laws of the prism apply here, too, and will help us to understand some of the main happenings in the formation of a rainbow.

A ray from the sun, incident upon

the upper half of a raindrop at any angle other than the vertical, is strongly *refracted* (bent) toward the normal (the perpendicular to the surface at the point of incidence). This means that rays striking this surface are bent toward the center of the drop in passing from the less dense atmosphere into the denser water. But it will be recalled that sunlight consists of many different wave-lengths generated by many different frequencies of vibration of the emitting source. Those toward the lower end of the visible spectrum are perceived by the human eye as red; those toward the upper end as violet. In between are the other colors, making up the spectrum—red, orange, yellow, green, blue, indigo, and violet.

Wavelengths refracted

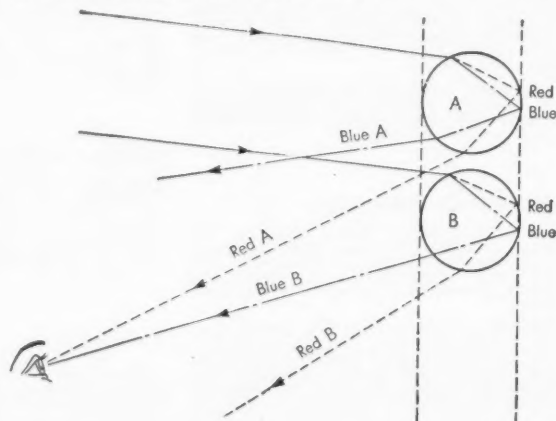
Each wavelength is refracted at a slightly different angle, and so when white light is bent by entering a medium of different density, it is fanned out into a spectrum of its component colors, the phenomenon being termed *dispersion*. The red rays are bent less sharply than the violet. Striking the rear wall of the drop at *greater than the critical angle* for emergence into air on the opposite side, these rays do not emerge at all, but suffer *total internal reflection*, as explained in this Department in the April, 1955, issue. The result is that all of the prismatic colors are reflected to the front of the drop and, upon emergence, undergo another *refraction*, this time bending away from the normal. Thus, to summarize, a "ray" of white light, approaching a raindrop from the sun, undergoes in succession, refraction, dispersion, internal reflection, and refraction, on its way to the observer's eye.



Formation of primary (inner) and secondary rainbows.

Path of sun's rays through raindrops in forming primary rainbow.

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The illustrations show only red and blue rays, at the two ends of the spectrum, for clarity of explanation. Note that these colors come to the eye of the viewer from different drops. The highly curved surface of the raindrop sends the emergent rays of different hues off in divergent directions so that no more than one color can be emitted to a given eye by a given drop. The falling curtain of rain, with innumerable drops, gives the impression of a stationary rainbow in the same way that successive frames of a rapidly moving strip of motion-picture film maintains the illusion of the picture remaining in the same place on the screen.

Red rays reach the eye along a line that makes an angle of approximately 42.5° to a line drawn between the sun and the viewer's eye; violet rays along a line making an angle of about 40.5° ; other colors in between these two limits. But the rainbow is seen from afar and the observer does not look at just one spot in the heavens, but scans the whole panorama. If we rotate the lines making these angles of 40.5 to 42.5° around the base line from sun to viewer, we will describe an arc, and thus the rainbow appears to him as an arch across the sky. The higher the sun, the lower the bow, and when the sun is at or above 42.5° elevation, the bow disappears below the horizon and cannot be seen. When the sun is low and the observer is on a high mountain or in a balloon, it is possible for him to see the complete circle of the rainbow. This would be a disillusioning experience, however, like losing one's belief in Santa Claus, for how could one find the pot of gold at the end of a rainbow that had no end?

The primary rainbow

The spectacle thus far described is the *primary rainbow*, in which the red rays are reflected to our eyes from raindrops that are at a higher altitude than those that reflect the violet rays; hence in this bow, red is outside, violet inside. Under favorable circumstances, a *secondary bow* is seen above the first, with the color sequence reversed, red being now inside and violet outside. This bow is always much fainter than the first and is produced by rays from drops for which the angles to the eye lie between 50.5 and 53.5° . Light enters the bottom halves of such raindrops and undergoes two

internal reflections, emerging from the upper halves. There are also supernumerary and complementary or spurious bows: since Newton's day it has become necessary to invoke practically everything in the book—diffraction, interference, and polarization of light—to provide a more complete explanation, which thus becomes far too complex for anyone save a specialist in optics to comprehend.

Difference in rainbows

An observant person will have noted that rainbows differ one from another. Not only will the height of the sun, the darkness of the rain clouds, and other effects of elevation and illumination have a bearing on the exact appearance but, most prominently, the size of the individual raindrops plays an important role. The width of the colored bands is inversely proportional to the diameter of the drops; the bands increase as the drops decrease and, finally, if the drops become very fine, the result is a complete overlapping-blending to produce that rare arch, the *white rainbow*. There is always overlapping of colors, even with raindrops of the largest size. This is because the sun, as viewed from earth, has a noticeable width and is not a mere point of light; consequently rays from different portions of the sun's diameter will make slightly different angles of refraction in a single drop, forming a band rather than a line, with the result that the color bands seen in the sky overlap and do not form what the physicist considers a pure spectrum.

The lunar rainbow is much rarer than the solar. Under the most favorable of conditions, with a brilliant full moon, the bow may be seen, though the colors are at best very faint and difficult to distinguish. On scales much smaller than that of the great arch in the sky, the solar rainbow is well displayed when mist or spray is substituted for rainfall. In the constant spray from large cataracts, as Niagara, a fine rainbow may be observed, as also to varying and lesser degrees in small waterfalls, fountains, or even in the stream from the garden hose or lawn sprinkler.

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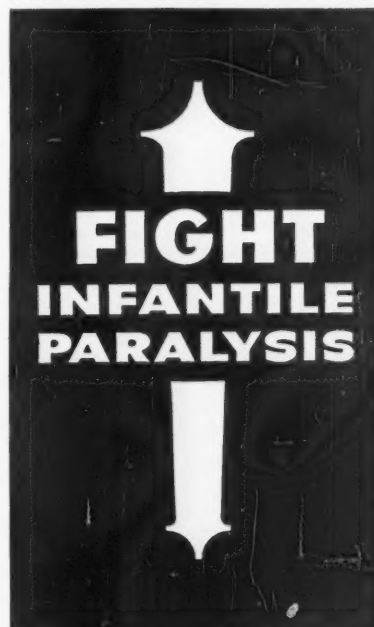
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The Microscope Makers XIII Testa

A NEW American firm arrived on the optical horizon in 1945, when the first Testa microscopes were made in a garage. Our illustration of their new plant will show, in a fashion more convincing than pages of writing, what ten years has seen in the accomplishments of the Testa Manufacturing Company.

The founder and president is Eric S. Guttmann, a German student and teacher who states that "Hitler did not like me and I did not like Hitler," in explanation of his departure from the fatherland. Guttmann learned the art of microscope-making when he taught in Berlin Technical University, where also he took the degree of Doctor of Engineering, a rare distinction in the United States. As a student he once worked his way over on a tanker to see Texas and New York. In 1938 he emigrated to America and rose from a twenty-five dollar per week job at a machine shop in Rome, New York, through a number of positions as a development engineer, to that of chief

engineer of an optical concern.

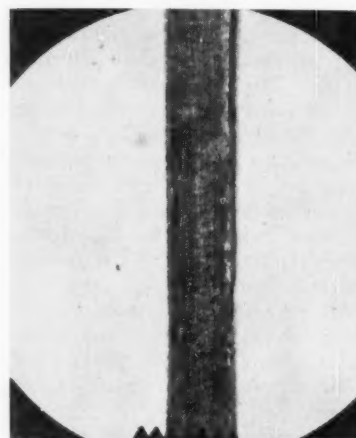
Deciding to organize a new firm, Dr. Guttmann had at first little confidence in his ability as a manufacturer, but put his heart into the venture and soon saw his first microscopes selling faster than he had anticipated. Profits were poured back into the business in order to improve the instrument, and soon additional models were designed and released.

In 1947, Guttmann became disgusted with the quality of the lenses that he could buy and so started his own lens-grinding shop. Within a short time he was able to round up a manufacturing program that offered a complete line of biological school microscopes that could be sold at a price below one hundred dollars. Today these Testa instruments are listed in many catalogs of firms supplying scientific equipment and apparatus to schools and colleges and have become deservedly popular with teachers, students, amateur microscopists, and with certain specialists, such as fur breeders.

At the start of the Korean War, Testa was asked to turn out a number of military instruments, including Army rangefinders, Navy sextants, and others. They made, and are still making in mass production, certain erector lenses which must have a radius and sphericity ground to an exactness as close as $\frac{1}{8}$ wavelength of light. In 1954 Testa graduated from subcontract to prime contract work. At present, as an instance, they manufacture optical sight testers for the Air Force that are used in checking the accuracy of computing bombsights. The company is also developing optical instruments for the Navy which are employed in the production of rockets. Also in 1954, Testa moved from their Pecan Street address in Los Angeles to nearby El Monte. Their new and larger home includes a special engineering department dedicated to the development of ever better inexpensive microscopes for educational purposes.

The latest Testa folder pictures interior views showing manufacturing and assembly, as well as four models of microscopes, borescope, inspection microscope, slide viewer, medical spectacles, illuminated microscope to check master phonograph records, magnifier for photographic focusing, range-finder collimator and alignment telescope and lenses, and

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Electron Microscope

The Electron Microscope in Biology is a reprint of an address by Ralph W. G. Wyckoff, Science Attaché of the U.S. Embassy in London, to the Royal Institution. Copies are available, as long as the supply lasts, from Editorial and Publications Division, Smithsonian Institution, Washington 25, D.C.

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An exciting new Nature Program* from the National Audubon Society

***Read below about an amazing FREE OFFER**

"**N**OTHING is more rewarding," says John Kieran, "than the study of nature in bringing parents and children together in a relaxed yet studious atmosphere. The National Audubon Society's new Nature Program combines good fun and entertainment with sound information. The full-color pictures are well chosen and well reproduced — the text is informative — and the subjects amount to an excellent basic nature library. I've tried out the Nature Program on my grandchildren — they love it!"

THE FREE GIFT described below (Value \$2.00) will introduce you and your family to a thrilling new experience. Now you can discover the wonders of Nature at home, under the guidance of friendly, inspired naturalists.

This revolutionary "Museum-at-Home" program has captured the imagination of thousands of families. With the aid of magnificent color photographs — and fact-filled albums in which to mount them — this program takes you "into the field" on a fascinating quest after Nature's marvels, oddities and secrets. *Best of all, your naturalist-guides will open your eyes to the wonders you can discover in your own backyard or park!*

Begin with a FREE set;

withdraw whenever you wish.

If you send the coupon at once, you will receive CAMOUFLAGE IN NATURE absolutely free of charge. Your Free Gift set includes 30 color prints, informative album and a beautiful case for your "Museum-at-Home" collection. In addition, while they last, you may have the illustrated handbook "FUN WITH BIRDS" showing how to attract, identify and enjoy Nature's most interesting creatures. *You assume no obligation when you send for this FREE set.* You may resign your enrollment anytime. However, we feel sure you will wish to continue these monthly "visits", — the total cost is only \$1 for each set, plus a few pennies for shipping. Mail the coupon today for your FREE introductory package.

**CUT OUT CARD
AND MAIL**

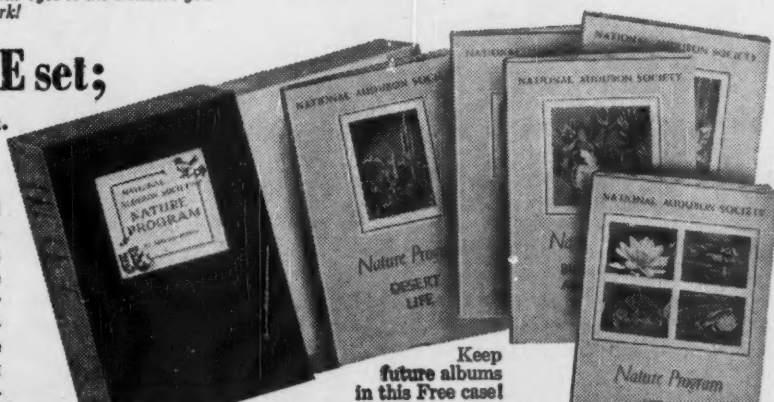
NO POSTAGE REQUIRED



JOHN KIERAN

Author of *An Introduction to Birds*, *An Introduction to Trees* and *An Introduction to Wild Flowers*, his amazing fund of knowledge has delighted millions on radio and TV

Each month a fascinating new topic is selected and a set of about 30 color prints is issued, together with an album in which to mount them and a text that explains your "Museum-at-Home" exhibits. As a demonstration, you may have the current set "CAMOUFLAGE IN NATURE" plus the illustrated handbook "FUN WITH BIRDS" as an ABSOLUTELY FREE gift package. Send coupon now.



Keep
future albums
in this Free case!

FIRST CLASS
Permit No. 3
(Sec. 349, P.L.&R.)
Garden City, N. Y.

BUSINESS REPLY CARD

No Postage Stamp Necessary If Mailed in The United States

4¢ POSTAGE WILL BE PAID BY—
THE AUDUBON NATURE PROGRAM,
Dept. NM-1

Garden City, N. Y.

An exciting new way you and the children can learn about the wonders of NATURE!



Everybody knows that the Ostrich is the biggest living bird. But did you know that it can run 30 miles an hour—that its kick can kill a man—that it has the largest eyes of any land creature?



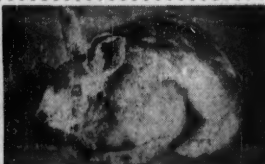
In an ordinary woodland pond you can find an amazing variety of fascinating creatures. Your Nature Program tells you what to look for, how to go about it.



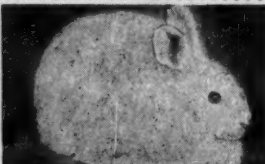
Discover awesome prehistoric titans, like the Stegosaurus—fifteen feet of armor-plated might, with a brain no larger than a walnut!



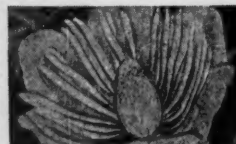
Natural color pictures show you unusual creatures like the Snowshoe Rabbit. In summer, he is the same color as his tundra home...



But when autumn comes, the weather gets colder, and he starts to change color. By the time the ground is covered with snow...



...he has become entirely white. Perfectly camouflaged once again, he is "invisible" to his enemies!



Which is the fragile flower and which is the flesh-eating animal? On the left is the lovely blossom of the Tulip Tree. But the "blossom" on the right is a hungry Sea Anemone, and its "petals" are waving tentacles, reaching out for prey!



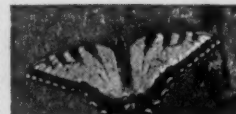
See the mysterious, exciting life of Nature after dark—the great owls who hunt their prey in almost total darkness—all the strange creatures who live by night!



Meet the lovable children of Nature—like the shy, tree-dwelling Kookoi, the model for the original "Teddy bear."



Explore the underwater world through the Nature Program's color cameras!



Collect a "Museum-at-Home" of butterflies like the lovely Tiger Swallowtail.

THE NATIONAL AUDUBON SOCIETY INVITES YOU TO ACCEPT THIS EXCITING FREE OFFER (VALUE \$2.00)

to introduce you and your family to this

WONDERFUL NEW NATURE PROGRAM

THE AUDUBON NATURE PROGRAM, Dept. NM-1, Garden City, N. Y.

Please send me FREE my introductory package, consisting of the CAMOUFLAGE IN NATURE collection of 30 natural color prints; a 7500-word informative album to mount them in; a handsome maroon-and-gold colored album case; and the illustrated handbook FUN WITH BIRDS—all FREE. I understand that you plan to issue a

new Nature series each month in cooperation with the National Audubon Society, for only \$1.00 each plus a small charge for shipping. After examining my FREE set, I'll notify you if I do not wish any others. I may cancel my subscription at any time I wish without further obligation.

NAME.....
(Please Print)
ADDRESS.....
CITY.....ZONE.....STATE.....

SEND NO MONEY—MAIL COUPON PROMPTLY

Right now is an excellent time to find out about the National Audubon Society's new Nature hobby! If you act at once, you may have FREE the current album "CAMOUFLAGE IN NATURE," complete with 30 full-color prints—the illustrated handbook "FUN WITH BIRDS"—and a sturdy, handsome case in which to store your albums.

Turn the page and read what famed naturalist JOHN KIERAN has to say about the Nature Program, then tear out and mail the postage-paid postcard while this offer lasts!

CUT OUT CARD AND MAIL
NO POSTAGE REQUIRED